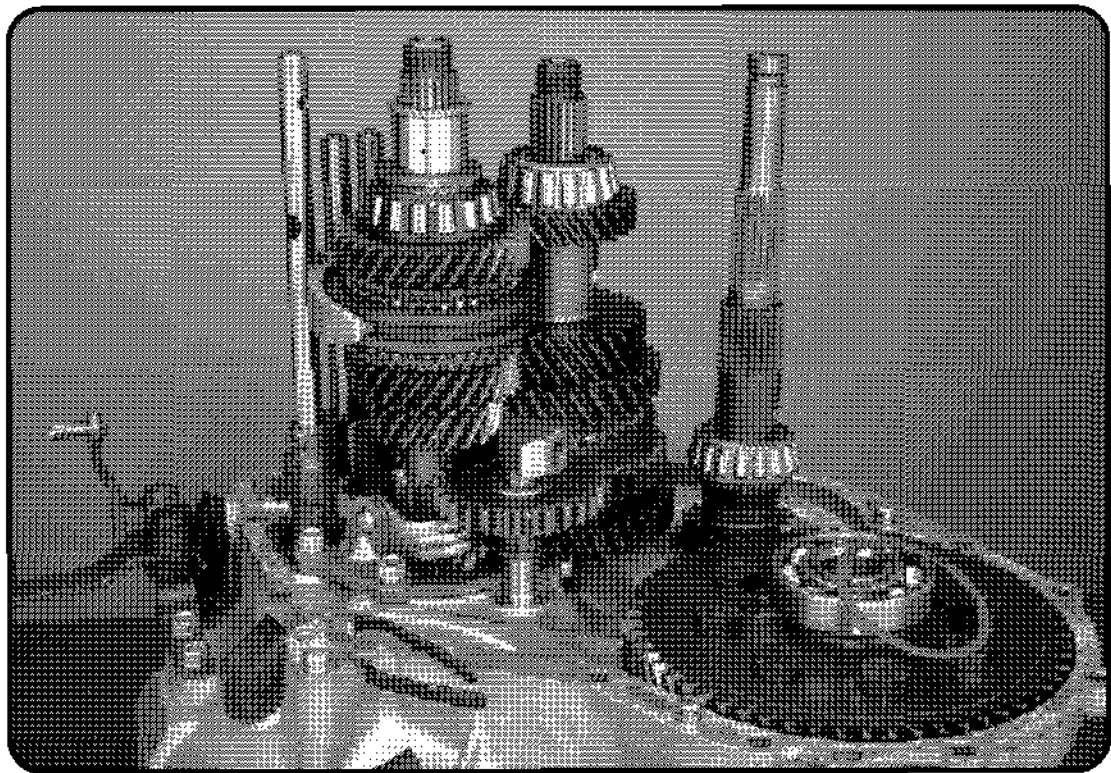


22.12

*Skill Module*

# *W5M31/33 Transaxle Repair*



*How will this module help you?*

*This module provides overhaul procedures for the W5M31/33 transaxles.*

*Hands on practice with these AWD transaxles will allow you to overhaul Mitsubishi 20 and 30 series transaxles with confidence.*



*Technical  
Training*

## **SAFETY IS YOUR RESPONSIBILITY**

This technical training module is for use by professional Mitsubishi Motors dealership service technicians. The descriptions and procedures in this publication supplement existing service manuals, technical service bulletins, and other documents provided by Mitsubishi Motor Sales of America, Inc. (MMSA). As a result, the use of these sources may be required to ensure a proper repair.

Within this module you will find *Notes*, *Cautions*, and *Warnings*. These references provide guidance to help you do your job efficiently and safely. The definitions for these terms are listed below.



### **NOTE**

The purpose of a *Note* is to help you do your job more efficiently. A *Note* may also provide additional information to help clarify a particular point or procedure.



### **CAUTION**

A *Caution* alerts you to the possibility of damage to either tools, equipment, or to the vehicle itself. A *Caution* recommends that a procedure must be done in a certain way to avoid potential problems resulting from improper technique or method.



### **WARNING**

A *Warning* alerts you to the highest level of risk. *Warnings* inform you that a procedure must be done in a particular way to minimize the chances of an accident that could result in personal injury or even loss of life.

When you see a *Note*, *Caution*, or *Warning*, be sure you understand the message before you attempt to perform any part of a service procedure. Also keep in mind it is impossible for MMSA to anticipate or evaluate every service situation a technician may encounter. For that reason, you have the final responsibility for personal safety—yours and those working around you. Be sure to always wear proper protective clothing and safety equipment, use the proper tools, and follow the repair procedures as outlined in various service publications provided by MMSA.

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Corporate Technical Training Department



### PERFORMANCE OBJECTIVE SIGN-OFF

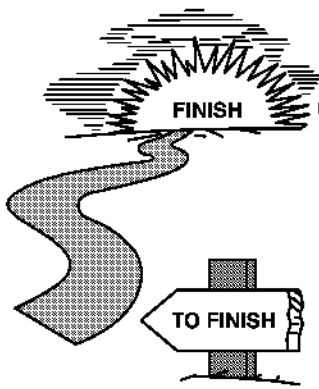
Have the instructor check your work.

**Instructor's  
Initials**

**Objective**

---

- |       |  |
|-------|--|
| _____ | 1. Overhaul a W5M31/33 transaxle.                                      |
| _____ | 2. Use solder crush techniques to setup bearing pre-load and end-play. |
| _____ | 3. Disassemble and assemble an AWD transfer case.                      |
| _____ | 4. Check and adjust bearing pre-load in the AWD transfer case.         |
| _____ | 5. Check and adjust gear tooth contact in the AWD transfer case.       |



## MODULE GOAL

You will overhaul the W5M31/33 transaxle, and All Wheel Drive transfer case.

## OBJECTIVES

Upon completion of this module, you will be able to do the following:

- overhaul a W5M31/33 transaxle.
- use solder crush techniques to setup bearing pre-load and end-play.
- disassemble and assemble an AWD transfer case.
- check and adjust bearing pre-load in the AWD transfer case.
- check and adjust gear tooth contact in the AWD transfer case.

## PREREQUISITE

Completion of Theory Module 22.11, 30 series AWD Transaxle Operation.

## WHAT YOU WILL NEED

Hand tools, Torque wrench, Dial caliper or micrometer, 2-jaw puller, Bearing splitter, Dial indicator, Solder (1/8 in. diameter)

Special tools

- MB990938-01
- MB998802-01
- MIT307098
- MD990988-A
- MD998806-01A
- MIT4336
- MD998245-01
- MD998822-01
- MD998323-01
- MIT208977

## FOR TRAINING CENTER PRACTICE ONLY

Many parts removed or discarded during service of a customer's transmission (seals, snap rings, spring pins, gaskets, etc.) are NOT replaced in class. Remove only those parts referenced in this module.

To avoid wear and tear on training components when tightening fasteners, reduce the torque values specified by one-half.

Do not use new gaskets or sealants when assembling components.

## DIRECTIONS

- Follow the instructions in this module, referring to related video or print material when directed.
- When you reach a **Performance Check**, ask your instructor to inspect your work and initial this Skill Module.

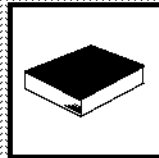
## TIME TO COMPLETE

About 4 hours.

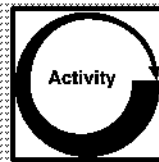
### Module Signposts



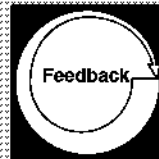
**Refer to the related video material for more information.**



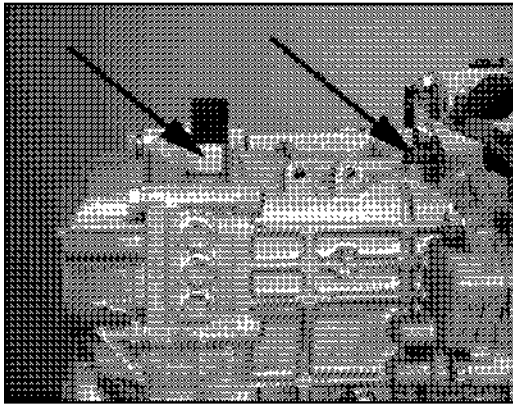
**Refer to the related publication for more information.**



**Perform the related activity and answer the related questions.**



**Complete the Knowledge Check or Performance Check to verify your understanding of the material.**



## TRANSAXLE DISASSEMBLY

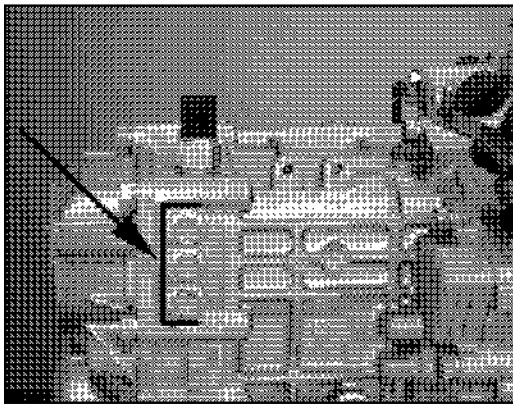
1. Place the transaxle on the workbench with the clutch housing down.

2. Remove the backup light switch.

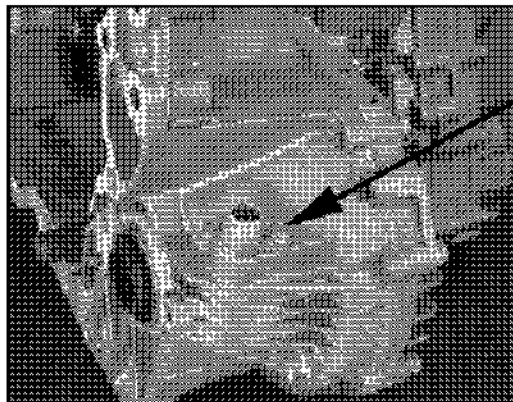
**Note** On training center transaxles, the gasket will be reused. On customer transaxles, the gasket must be replaced with a new gasket.

3. Remove the restrict ball assembly.

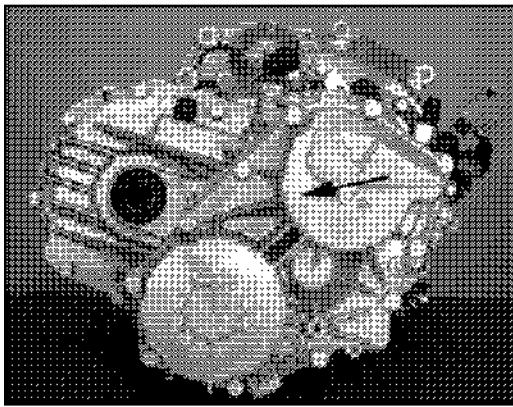
**Note** On training center transaxles, the gasket will be reused. On customer transaxles, the gasket must be replaced with a new gasket.



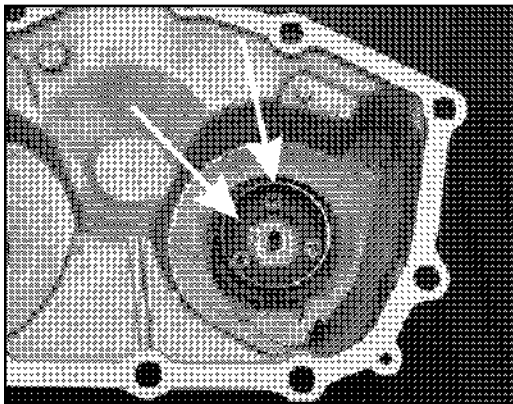
4. Remove all three poppet plugs, springs and balls. You may need a small magnetized screwdriver to retrieve the balls. These components are completely interchangeable.



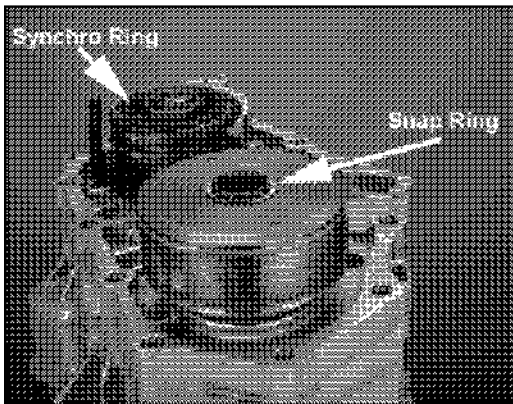
5. Remove the retaining bolt, and pull the speedometer drive gear assembly out.



6. Remove the rear cover.



7. Examine the reverse brake cone and wave washer in the rear cover. Leave them in the rear cover on training center transaxles.



8. Remove the reverse synchronizer ring.

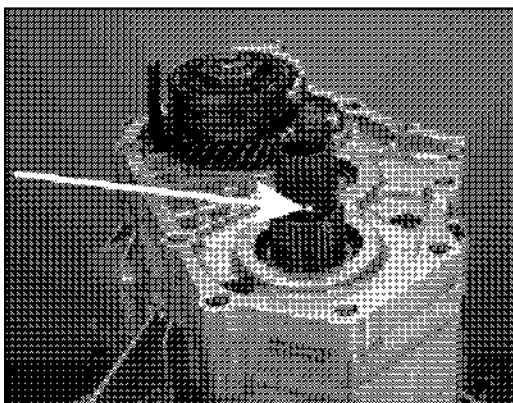


*Do not interchange the synchronizer ring on the 5<sup>th</sup>/Reverse Synchro. The largest one fits on the reverse brake cone. The smallest one fits on the 5<sup>th</sup> speed gear.*

9. Remove the snap ring securing the VCU and remove the VCU. You may have to pry gently under the VCU to get it off the shaft.

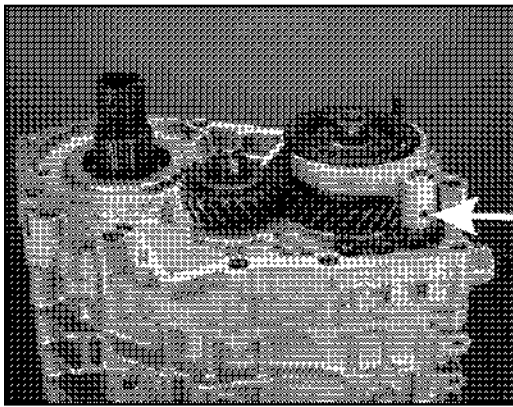


*On training center transaxles, the snap ring will be reused. On customer transaxles, the snap ring must be replaced with a new one.*



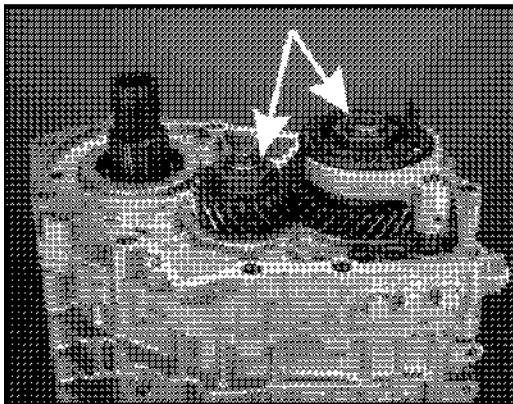
10. Remove the steel ball from the splined shaft.





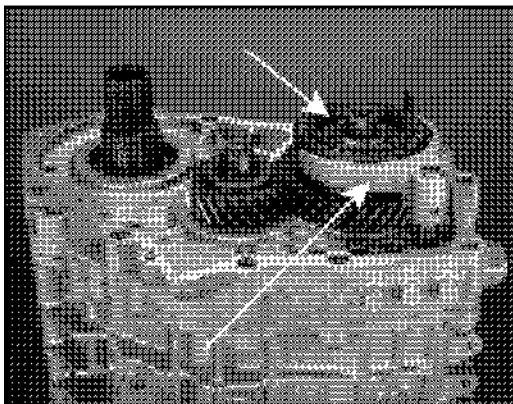
11. Drive out the spring pin on the 5<sup>th</sup>/R shift fork.

**Note** Make sure there is clearance behind the pin when you drive it out.



12. Unstake the locknuts on the input shaft and intermediate shaft, then remove them. In order to loosen the locknuts, you need to lock up the transaxle. There are several ways to do this:

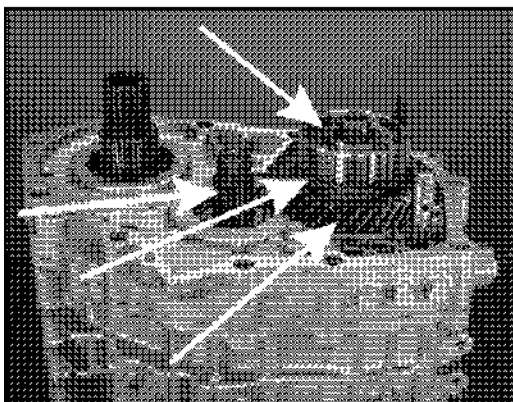
- Wedge a shop cloth between two meshed gears.
- Install special tool (MB998802-01) on the input shaft to hold it, and shift the transaxle into gear.
- Engage any two synchronizers to select two gears at once.



13. Slide the 5<sup>th</sup> gear synchronizer sleeve and shift fork off the input shaft.

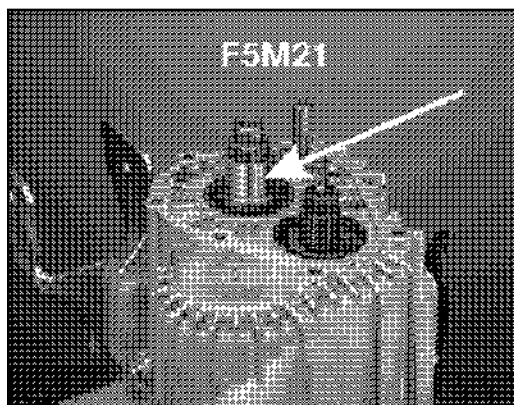
14. Slide the 5<sup>th</sup> gear synchronizer hub, and ring off of the input shaft. Also remove the 5<sup>th</sup> speed gear and split needle bearing from input shaft.

**Note** Do not interchange the synchronizer ring on the 5<sup>th</sup>/Reverse Synchro. The largest one fits on the reverse brake cone. The smallest on fits the 5<sup>th</sup> speed gear.

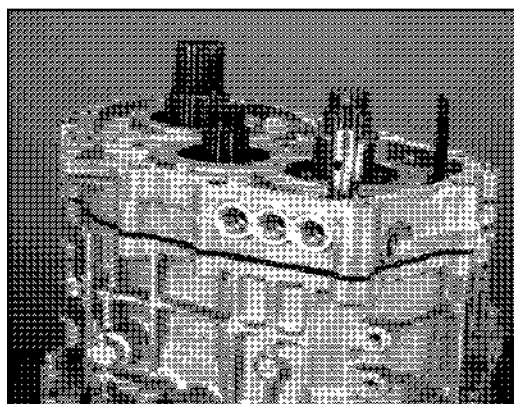


15. Pull 5<sup>th</sup> gear from the intermediate shaft. Use two small pry bars or a small 2 jaw puller.

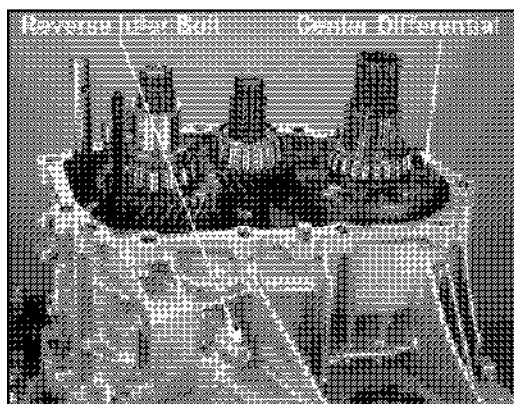




**Note** On F5M21 transaxles only, remove the bearing sleeve and snap ring on the input shaft. The bearing sleeve hides the snap ring when it is installed. These parts are not used on other transaxles.



16. Remove the transaxle case adapter assembly.

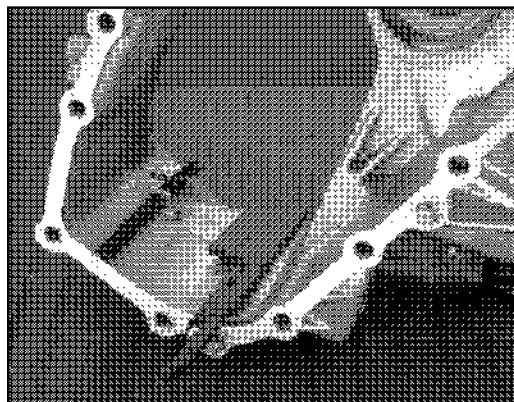


17. Lift out the center differential.

18. Remove reverse idler shaft bolt. Save the gasket.

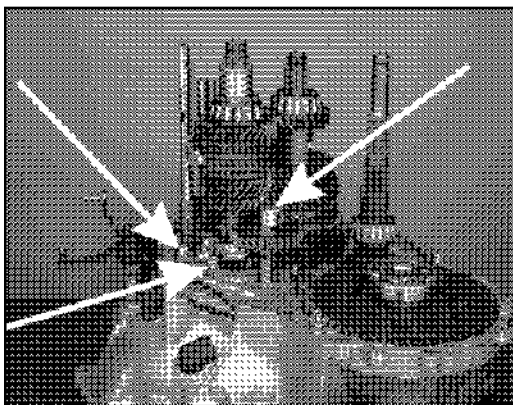
**Note** On training center transaxles, the gasket will be reused. On customer transaxles, the gasket must be replaced with a new gasket.

**Note** The reverse idler shaft bolt is tapered on the end.



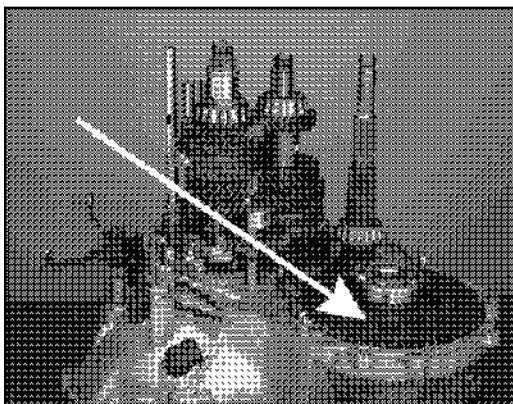
19. Remove transaxle case from the clutch housing. Tap it off with a soft mallet. Usually, the front differential bearing hangs in the case.

**Caution** Be careful not to damage the plastic oil guide(s) in the transaxle case. Some models only have one oil guide.



20. Lift out the reverse idler gear and shaft.

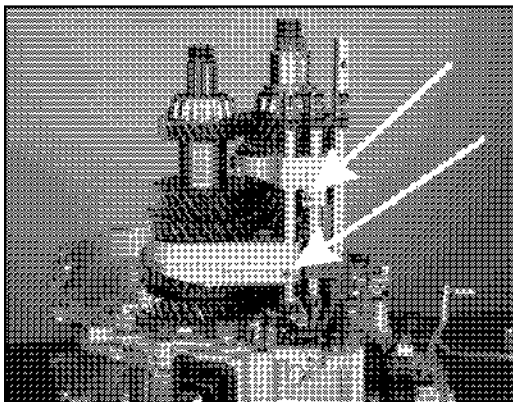
21. Remove the two bolts securing the reverse idler lever assembly and shoe.



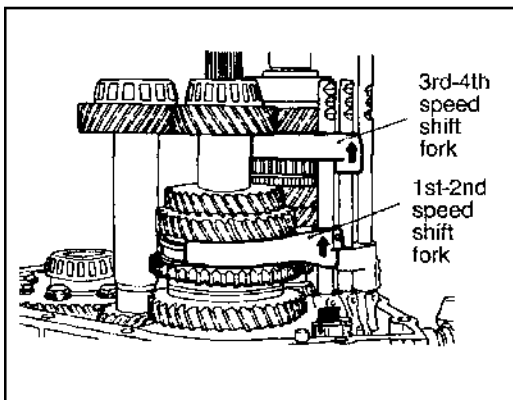
22. Lift out the front differential.

23. Lift out the center shaft, front output shaft and needle bearing.

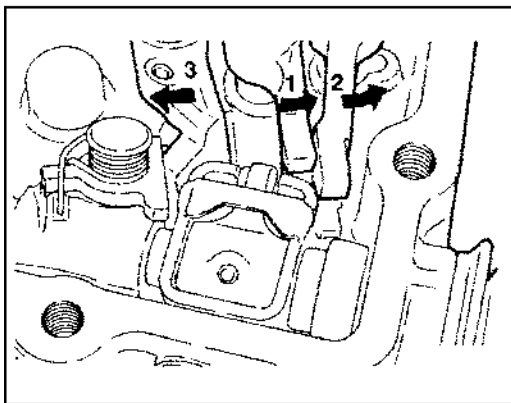
**Note** Retrieve the small needle bearing in the front output shaft.



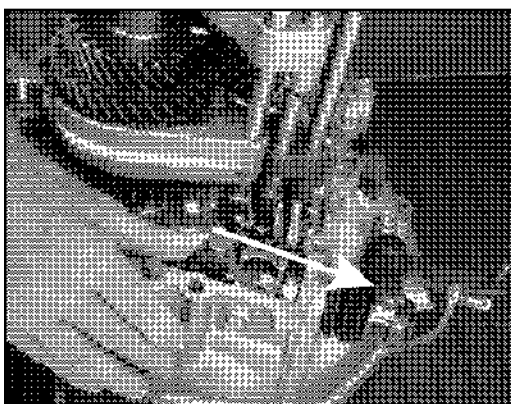
24. Drive out the spring pins on the 1<sup>st</sup>/2<sup>nd</sup> and 3<sup>rd</sup>/4<sup>th</sup> shift forks.



25. Shift all synchronizer sleeves up.



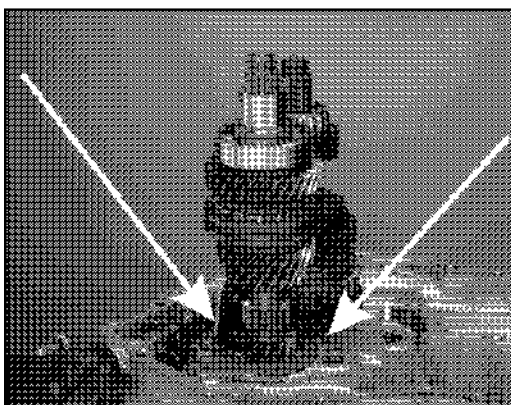
26. Spread the shift lugs as shown in the photo.



27. Push the control shaft as shown to clear the 1<sup>st</sup>/2<sup>nd</sup> shift lug, then lift out the shift rail assembly.

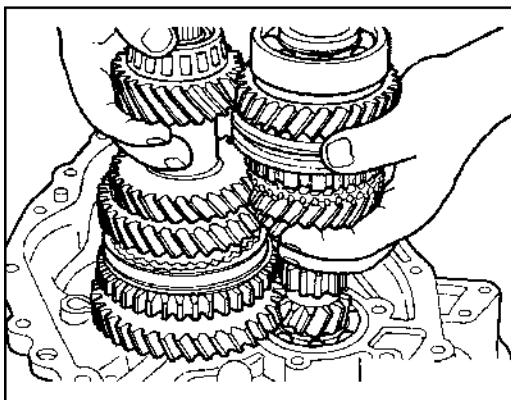
**Note** Sometimes this requires jockeying the shift rails, forks and shafts around to get the assembly out.

**Note** On W5M33 models, the input and intermediate shafts will come out at the same time.



28. On W5M31 transaxles, remove the Allen screw and bolt securing the bearing retainer for the input shaft.

**Note** This part serves as a bearing retainer on the W5M31 only. On the W5M33 it does not hold the input shaft bearing in place.

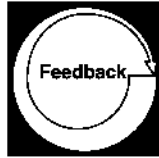


29. Lift out the input shaft and intermediate shaft together.

**Note** Since they are removed together, this requires some jockeying of the shafts to get them out.



*There is no need to remove the oil seals from the clutch housing on training center equipment. However, these would not be reused on a customer's transaxle.*



**PERFORMANCE CHECK**

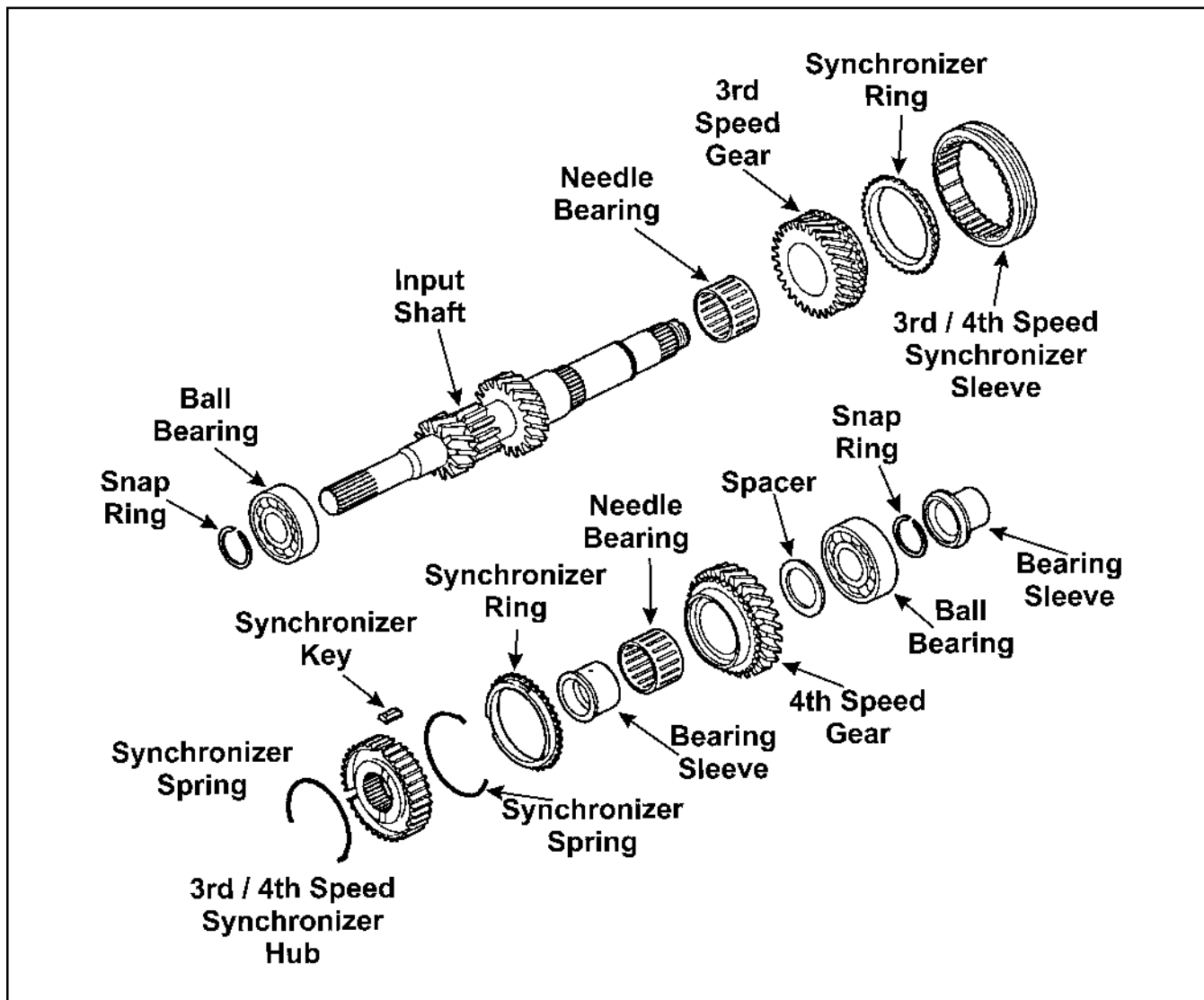
Have the instructor check your work before proceeding.

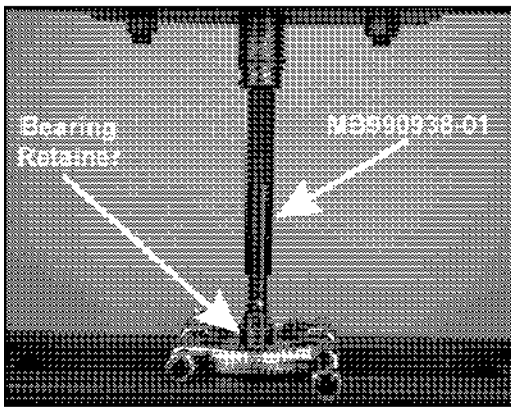
**INSTRUCTOR SIGNOFF:** \_\_\_\_\_

### INPUT SHAFT DISASSEMBLY

To disassemble the input shaft, you will need a hydraulic press and bearing splitter such as special tool MD998801.

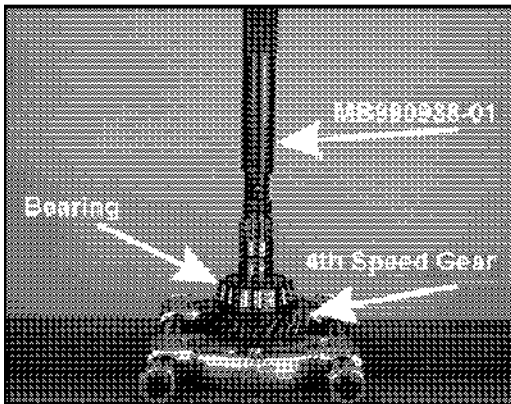
**Note** The 1997 W5M33 uses a doubler cone synchro for 1<sup>st</sup>/2<sup>nd</sup> gear.





1. Fit the bearing splitter under the bearing sleeve on the rear end of the input shaft and press it off with special tool MB990938-01.

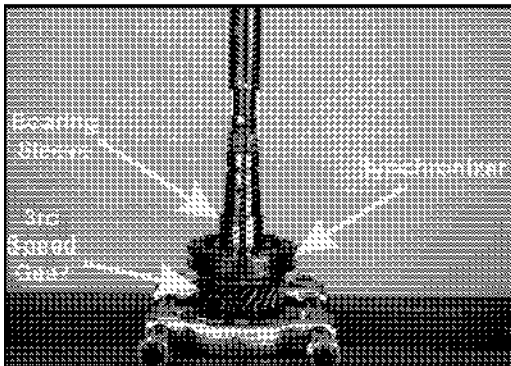
2. Remove the snap ring securing the rear input shaft bearing.



3. Fit the bearing splitter under the 4<sup>th</sup> speed gear, and press off the gear, bearing and spacer.

**Note** The spacer is used only on the W5M31.

4. Slide the needle bearing off the bearing sleeve.



5. Fit the bearing splitter under the 3<sup>rd</sup> speed gear, and press off the gear, synchronizer assembly and 4<sup>th</sup> speed gear bearing sleeve.

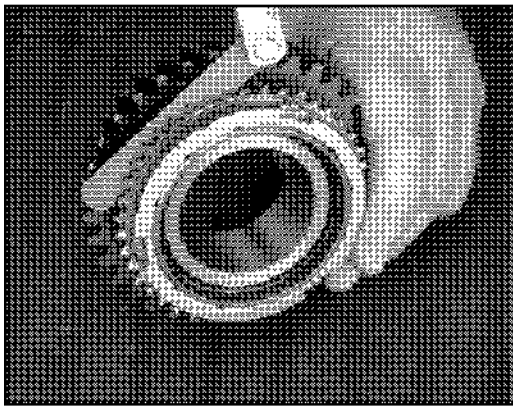
6. Remove the needle bearing from the shaft. On some models, there may be a spacer next to the bearing.

**Note** It is not necessary to remove the rear bearing from the input shaft in the next two steps on training center transaxles. Check with your instructor before proceeding.

7. On models with ball bearings, remove the snap ring on the front (clutch end) of the input shaft.

8. Fit the bearing splitter under the front input shaft bearing and press it off.

**Note** Tapered roller bearings can be damaged when removed this way.



### INPUT SHAFT ASSEMBLY

1. Check the clearance between the 3<sup>rd</sup> speed gear and its synchro ring with a feeler gauge. If the clearance is less than 0.5mm (0.020 inch), replace the ring and/or the gear.
2. Check the clearance between the 4<sup>th</sup> speed gear and its synchro ring with a feeler gauge. If the clearance is less than 0.5mm (0.020 inch), replace the ring and/or the gear.
3. Check all parts for signs of wear or damage.

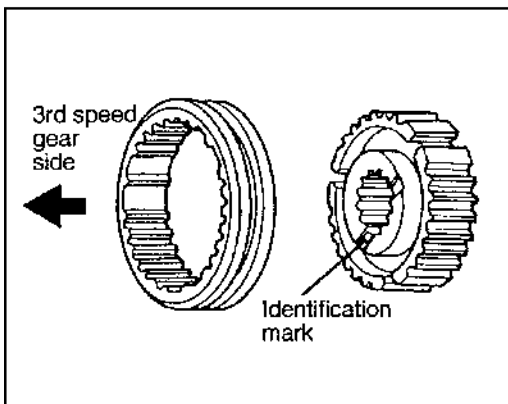


### PERFORMANCE CHECK

Discuss parts inspection with instructor before proceeding.

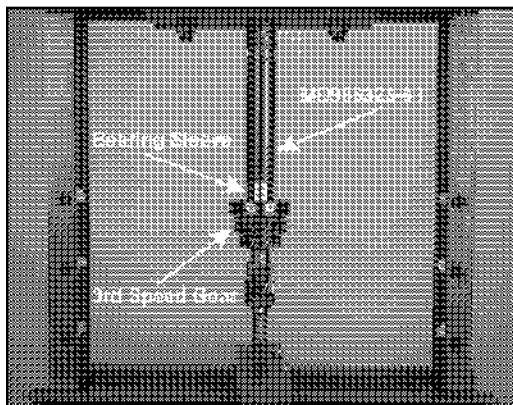
### INSTRUCTOR SIGNOFF: \_\_\_\_\_

4. Slide the 3<sup>rd</sup> speed gear, needle bearing and spacer (if equipped) on the input shaft.
5. Slide the synchro rings, synchro hub and synchro sleeve on the shaft.

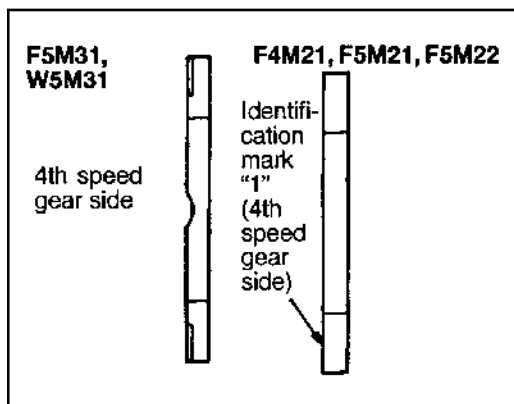


*The hub must be installed with the dot stamped in the oil groove towards the 3<sup>rd</sup> speed gear.*

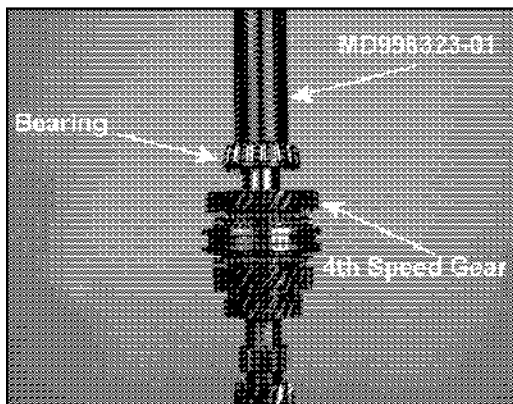




6. Slide the bearing sleeve on the shaft, then press the bearing sleeve onto the shaft with special tool MD998323-01.
7. Slide the 4<sup>th</sup> speed gear and needle bearing on the shaft.
8. Slide the spacer (W5M31 only) on the shaft.



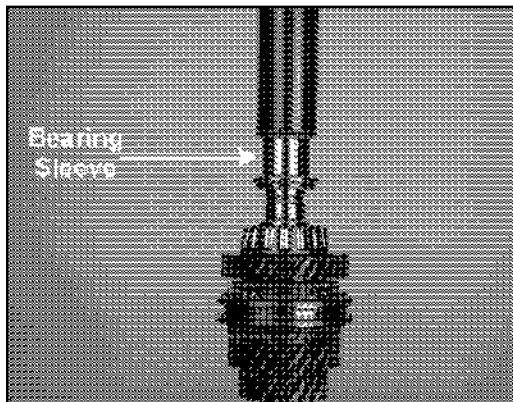
**Note** *Not all transaxles use this spacer. For those that do, check the spacer carefully. Some are stamped "1". This identification must be installed on the 4<sup>th</sup> speed gear side as shown. The W5M31 spacer has a machined cutout which must be installed towards 4<sup>th</sup> speed gear.*



9. Slide the rear input shaft bearing on the shaft, then press the bearing onto the shaft with special tool MD998323-01.

**Caution** *Make sure that the special tool bears on the inner race of the bearing, not the outer race. Pressure on the outer race can damage the bearing.*

10. Install the snap ring securing the rear input shaft bearing.

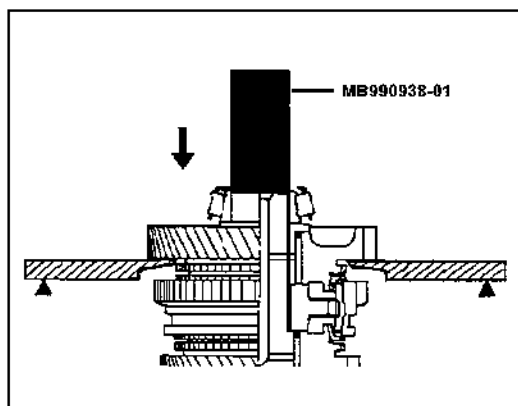
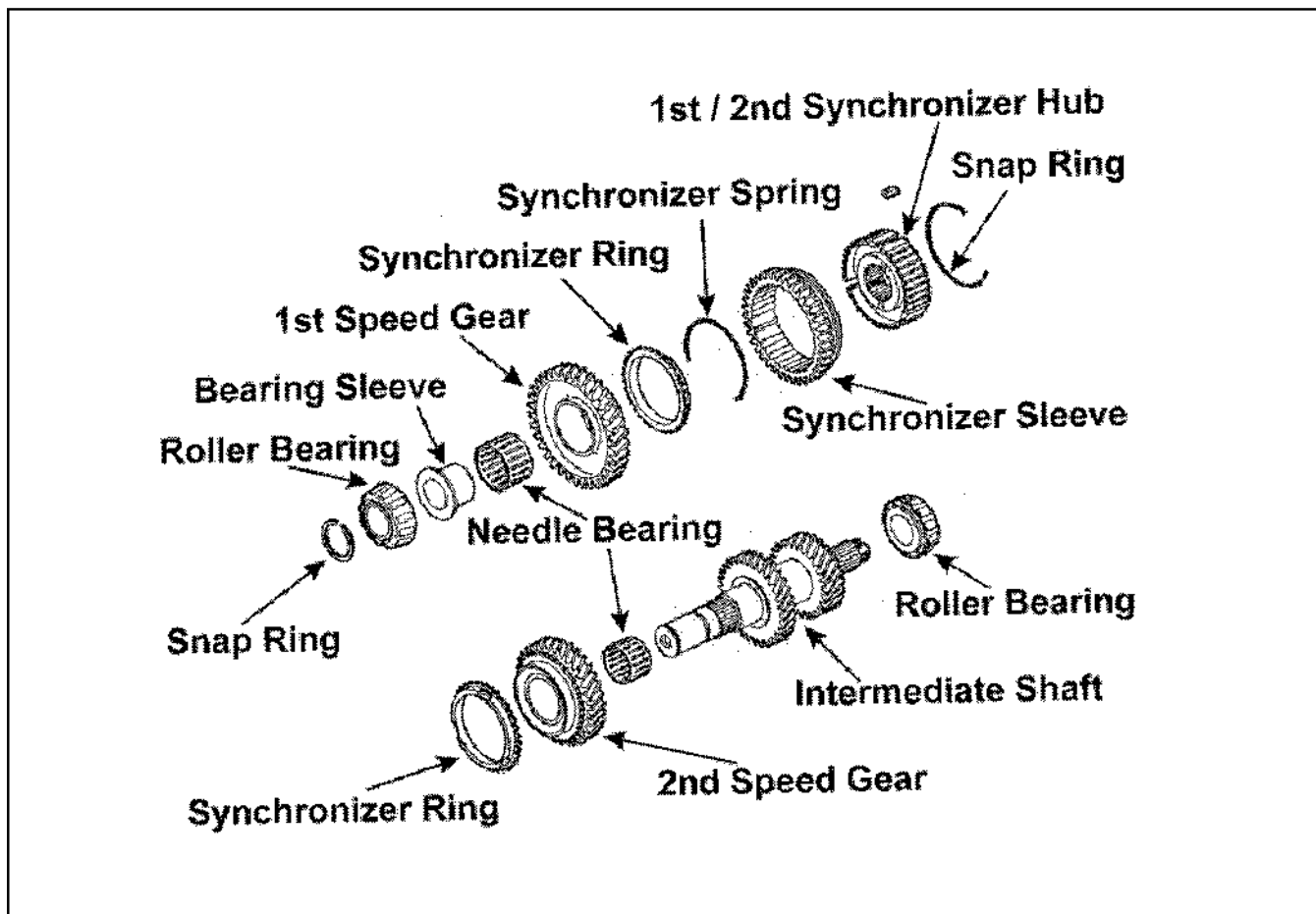


**Note** *On training center transaxles, the snap ring will be reused. On customers vehicles, the snapping must be replaced.*

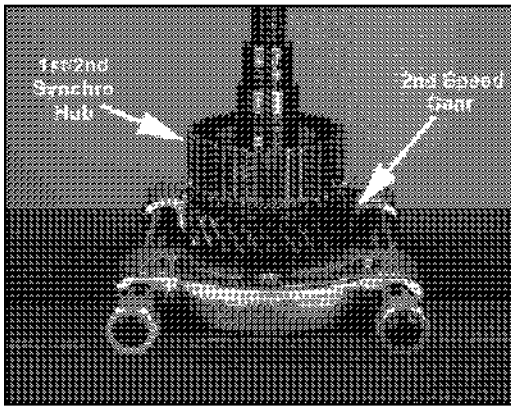
11. Slide the bearing sleeve on the shaft, then press it on with special tool MD998323-01.
12. If the front input shaft bearing was removed during disassembly, press it on the input shaft, and secure it with the snap ring.

## INTERMEDIATE SHAFT DISASSEMBLY

1. Remove the snap ring on the clutch end of the intermediate shaft.



2. Fit the bearing splitter under the 1<sup>st</sup> speed gear, then press off the gear, bearing sleeve and front bearing. Use special tool MB990938-01.
3. Slide the 1<sup>st</sup>/2<sup>nd</sup> synchro off.

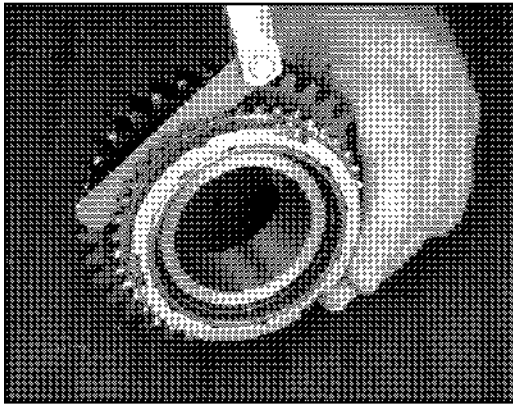


**Note** Most synchro hubs slide right off. Others must be pressed off.

4. Slide the 2<sup>nd</sup> speed gear off.
5. Remove the needle bearing for the 2<sup>nd</sup> speed gear.

**Note** It is not necessary to remove the rear bearing from the intermediate shaft in the next step on training center transaxles. Check with your instructor.

6. Fit the bearing splitter under the rear bearing, then press the bearing off.



### INTERMEDIATE SHAFT ASSEMBLY

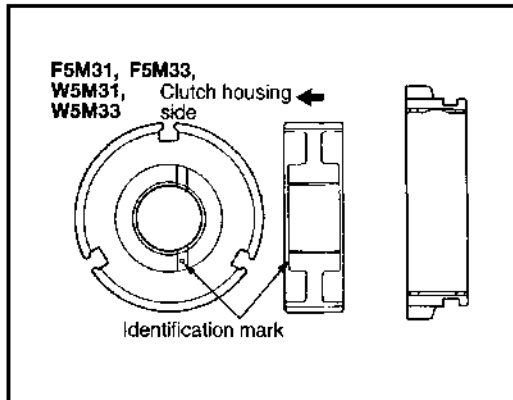
1. Check the clearance between the 1<sup>st</sup> speed gear and its synchro ring with a feeler gauge. If the clearance is less than 0.5mm (0.020 inch), replace the ring and/or the gear.
2. Check the clearance between the 2<sup>nd</sup> speed gear and its synchro ring with a feeler gauge. If the clearance is less than 0.5mm (0.020 inch), replace the ring and/or the gear.
3. Check all parts for signs of wear or damage.



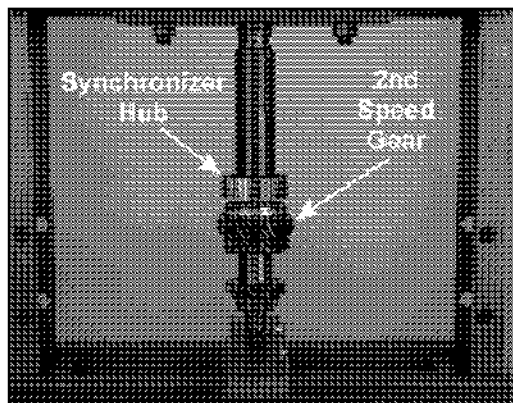
### PERFORMANCE CHECK

Discuss parts inspection with instructor before proceeding.

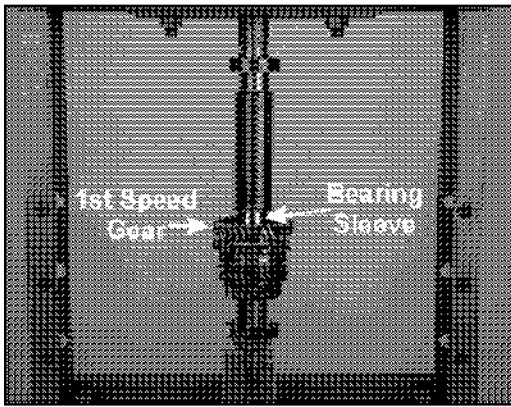
**INSTRUCTOR SIGNOFF:** \_\_\_\_\_



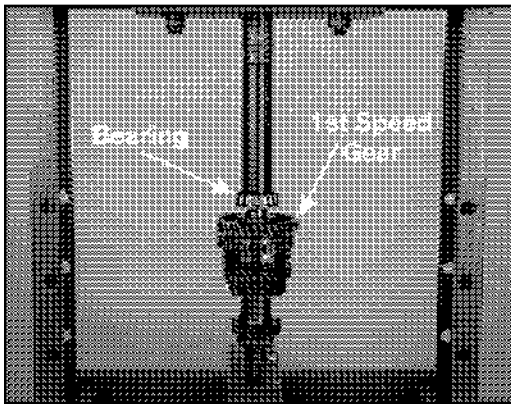
4. Install the 2<sup>nd</sup> speed gear and needle bearing on the shaft.
5. Place the 1<sup>st</sup>/2<sup>nd</sup> synchronizer rings, hub and sleeve on the shaft.



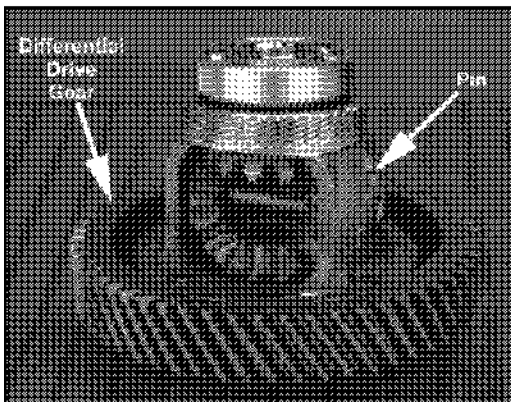
**Note** The hub may have a punch mark in the oil groove. Make sure this punch mark goes towards 2<sup>nd</sup> gear.



6. If necessary on some models, press the synchro hub on the shaft with special tool MD998323-01.
7. Slide the 1<sup>st</sup> speed gear and needle bearing on the bearing sleeve, then slide the bearing sleeve on the shaft. Press the bearing sleeve on with special tool MIT208977.

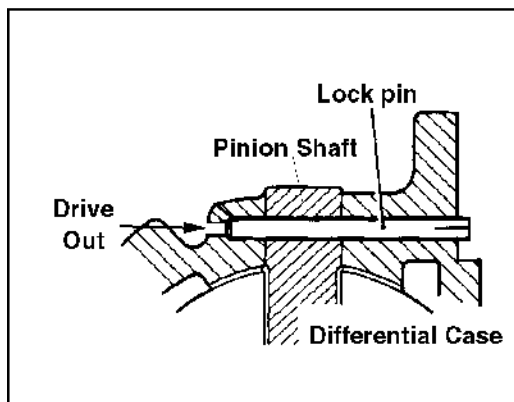


8. Press the front bearing on the shaft with special tool MD998323-01.
9. Install the snap ring to secure the front bearing.
10. Press the rear bearing (if removed) on the shaft with special tool MD998323-01.



#### FRONT DIFFERENTIAL DISASSEMBLY/ASSEMBLY

1. Hold the differential case in a vise with soft jaws.
2. Remove the differential drive gear.
3. Drive out the pin securing the pinion shaft, and remove the pinion shaft.

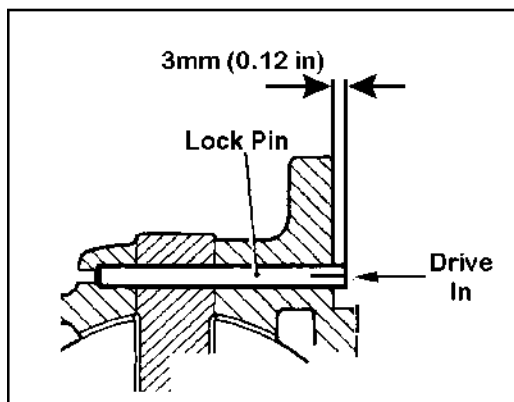


**Note** The pin is tapered, drive it out in the direction shown in the illustration.

4. Remove the pinion gears.
5. Remove the side gears and selectable spacers.

**Note** The spacers are used to set up a certain amount of backlash in the side gears.

6. Install the side gears and spacers.
7. Install the pinion gears and shaft.

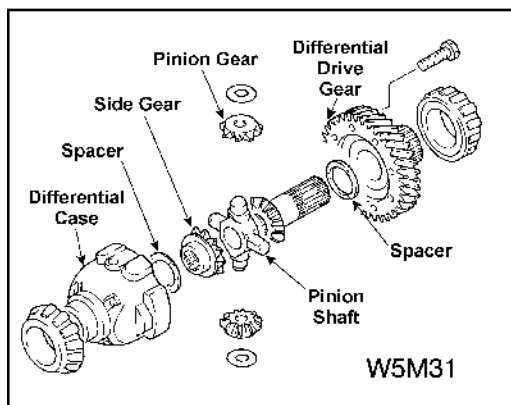


8. Install the lock pin. If the pin was completely removed, install it so that the end with the largest chamfer is inserted first. Make sure no more than 3mm (0.12 in) protrudes from the case.

**Note** Drive it in from the drive gear end.

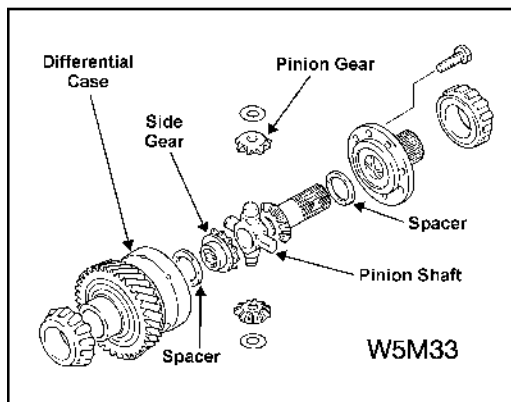
9. Install the differential gear, and torque to 135 Nm (98 ft.-lb.)

**Note** If the differential gear is marked, the mark should line up with the lock pin.



## CENTER DIFFERENTIAL DISASSEMBLY/ ASSEMBLY

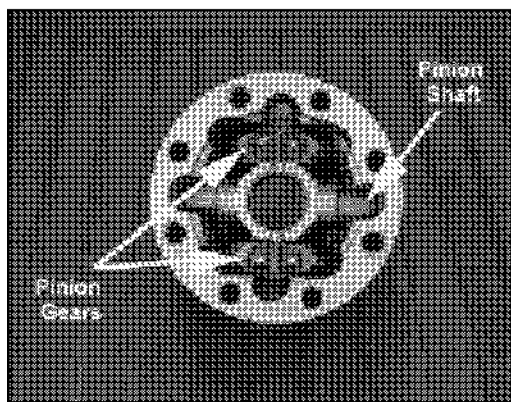
1. Hold the differential case in a vise with soft jaws.
2. On W5M31 differentials, remove the output gear.
3. On W5M33 models, remove the bolts securing the differential cover.
4. Remove the side gear and selectable spacers.
5. Remove the pinion shaft.
6. Remove the pinion gears and washers.
7. Remove the other side gear and selectable spacer.



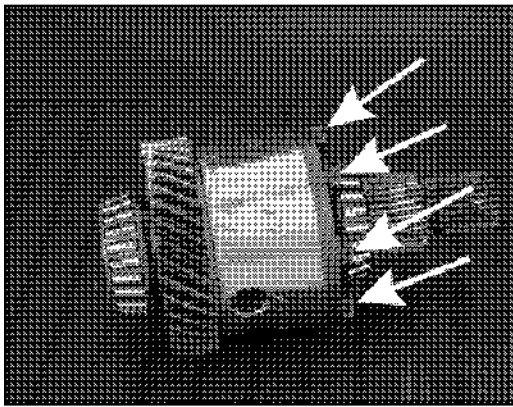
**Note** The spacers are used to set up a small amount of backlash in the side gears. Refer to the service manual for procedures and specifications.

**Note** On late models one of the spacers may be a non-selectable brass spacer.

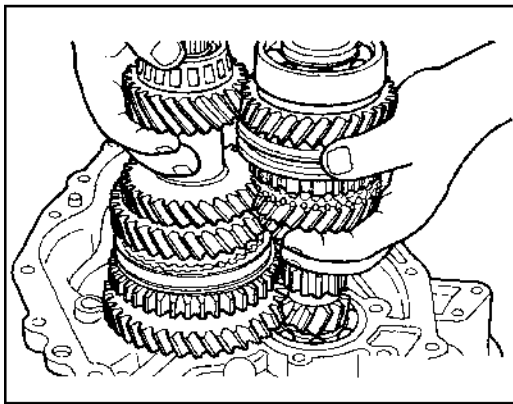
8. Install the side gear and spacer in the center differential case.
9. Install the pinion gears and washers on the pinion shaft.
10. Install the pinion shaft in the case.
11. On W5M31 differentials, install the washer and side gear in the output gear.







12. Bolt the output gear to the center differential case.
13. On W5M33 models, install the washer and side gear in the differential cover. Bolt the cover to the center differential case.
14. Torque the output gear or cover bolts to 75 Nm (55 ft.-lb.)

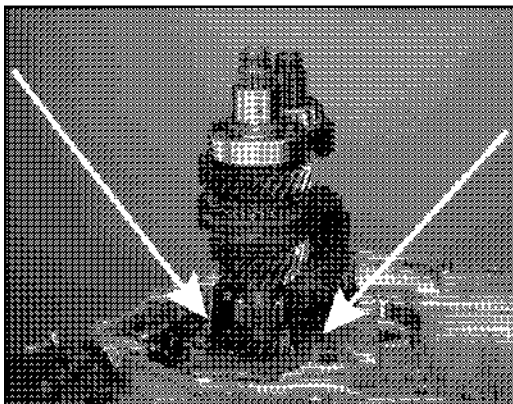


### TRANSAXLE ASSEMBLY

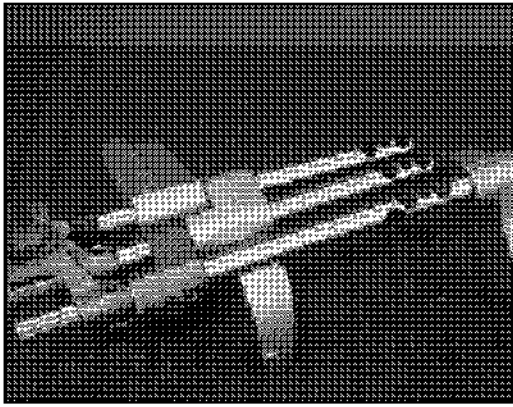
1. Place the transaxle on the bench with the clutch housing down.
2. Install the input shaft and intermediate shaft together.



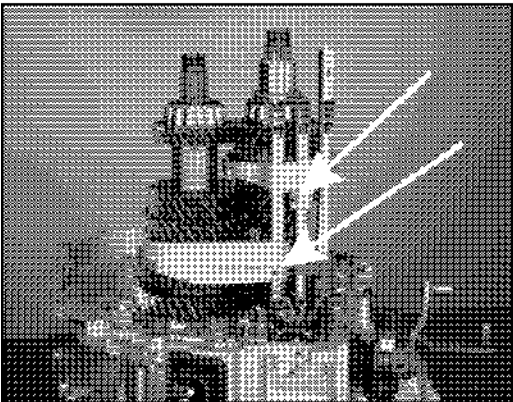
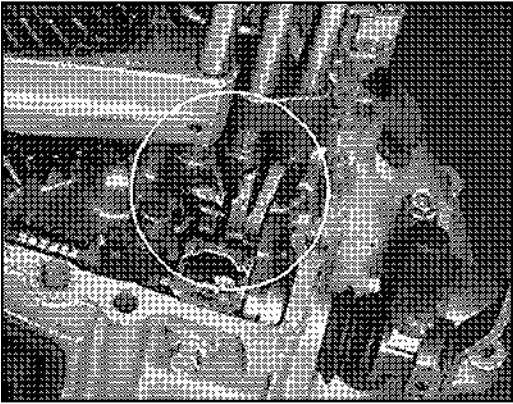
*Be careful not to damage the oil seal with the end of the input shaft.*



3. Install the bearing retainer with the Allen screw and bolt.



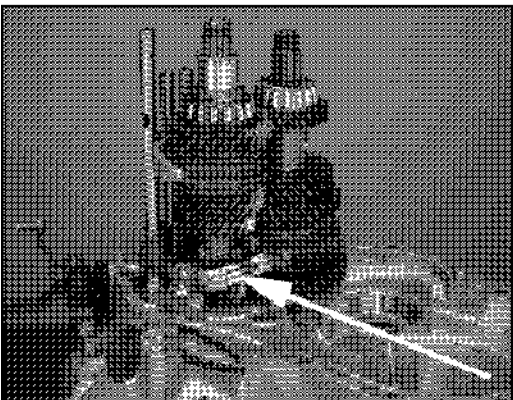
4. Install the shift rail assembly. Make sure the shift forks are properly seated in the synchronizer sleeves and the shift lugs engage with the control shaft.



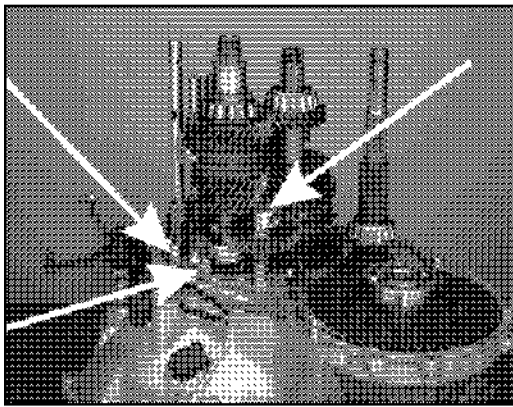
5. Drive in the spring pins on the 1<sup>st</sup>/2<sup>nd</sup> and 3<sup>rd</sup>/4<sup>th</sup> shift forks.



*Special tool MD998245-01 is made for this.*



6. Install the reverse idler lever assembly.



7. Install the reverse idler gear and shaft. Make sure the shoe fits in the groove in the reverse idler gear.
8. Install the front output shaft and needle bearing. Use light grease or Vaseline to make sure the needle bearing stays in place.
9. Install the front differential.



### PERFORMANCE CHECK

Before proceeding, discuss the solder crush techniques with the instructor.

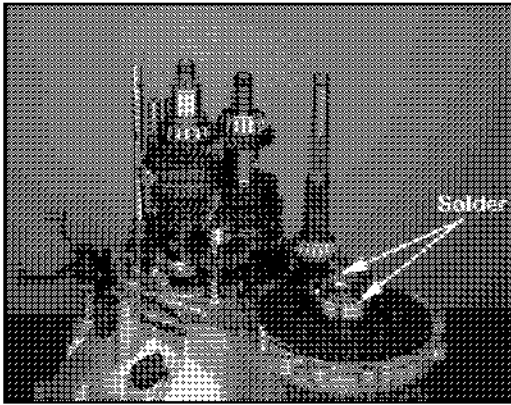
### INSTRUCTOR SIGNOFF: \_\_\_\_\_

#### *Did You Know...*

#### ***Pre-load vs. End-Play***

*In order for bearings to work properly, ball bearings are usually set up to allow a certain amount of end play in the shaft to ensure that the bearing is not under pressure. Tapered roller bearings, on the other hand, are usually set up with a certain amount of pre-load or pressure on them.*

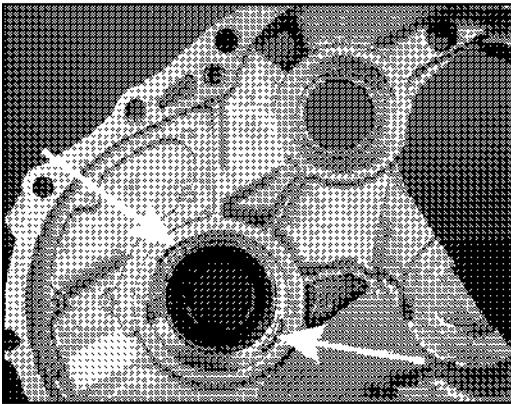
*The solder crush test is used to determine how much end play is in a particular shaft. If the shaft uses ball bearings where some end play is desired, you select a spacer that is slightly thinner than the crushed solder. If the shaft uses tapered roller bearings where some pre-load is desired, you select a thicker spacer than the crushed solder.*



### Transaxle Case Solder Crush Test

**Note** In steps 10-14, you will use the solder crush test to select a spacer that gives the correct end-play for the front differential.

**Note** On customer's vehicles, refer to the Service Manual for required PRE-LOAD or END-PLAY requirements for all shafts.



10. Cut two pieces of solder measuring about 3/4 inch (20mm) in length and about 1/8 inch (3mm) in diameter. Lay them on the front differential bearing, or in the transaxle case as shown in the illustration.

**Note** Hold them in place with light grease or Vaseline.

11. Leave the large spacer for the differential bearing off.

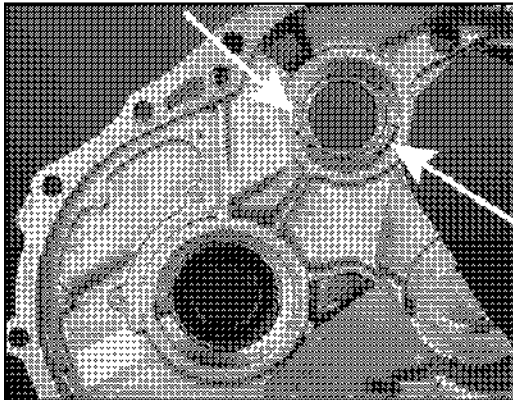
12. Fit the transaxle case over the shafts and onto the clutch housing. Install the case bolts and torque them to 39 Nm (29 ft.lbs.). Proper torque is important to get an accurate amount of solder crush.

13. Remove the transaxle case. Remove the two pieces of solder.

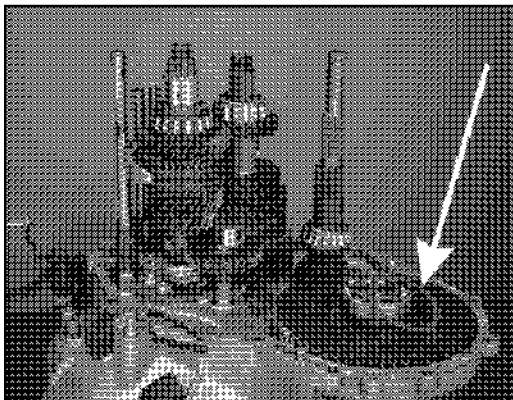
14. Measure the thickness of both pieces of solder with a micrometer or dial caliper.

End-Play Calculation (Ball Bearing)

1. Thickness of first piece: \_\_\_\_\_ mm  
PLUS (+)
  2. Thickness of second piece: \_\_\_\_\_ mm  
EQUALS (=)
  3. Total thickness: \_\_\_\_\_ mm  
Divide ( $\div$ ) by 2
  4. Average thickness: \_\_\_\_\_ mm  
MINUS (-)
  5. Specified end-play: \_\_\_\_\_ mm  
EQUALS (=)
- Calculated spacer thickness: \_\_\_\_\_ mm



**Note** *If this were a customer's transaxle, you would also check pre-load of the front output shaft in the same manner. To do this, lay solder in the bearing recess in the case and install the bearing race over it. This is not necessary in the training center.*

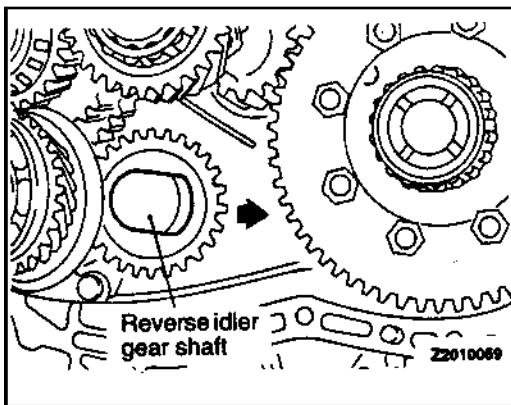


15. Install a large spacer closest to the thickness calculated.

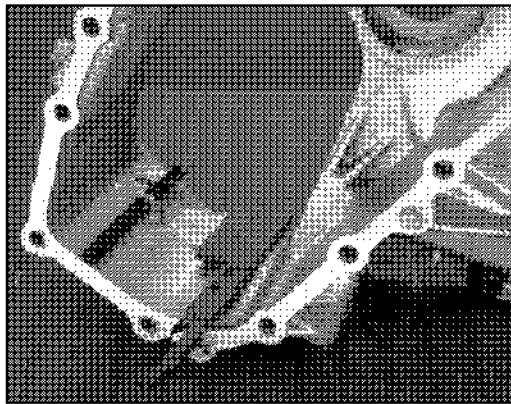
**Note** *See the Service Manual for a list of available spacers. On training center transaxles, reuse the original spacer removed during disassembly.*

16. Check that the front output shaft bearing race and spacer are in the transaxle case.

17. Place the spacer for the front differential over the ball bearing race. Stick it in place with light grease or Vaseline.



18. Align the bolt hole in the reverse gear idler shaft approximately so that it will line up with the hole in the transaxle case.

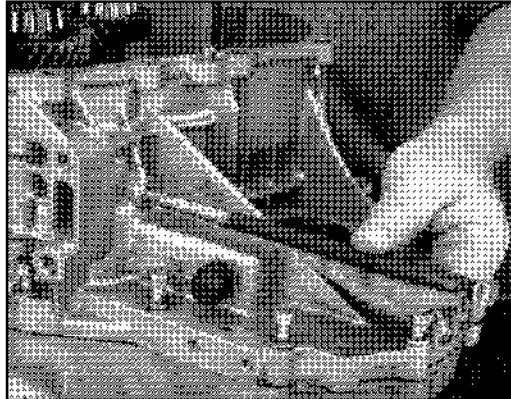


19. Check that the plastic oil guides are properly installed in the case.



*Some transaxles only use one oil guide.*

20. Fit the transaxle case over the shafts and onto the clutch housing. Don't bolt it in place yet.



21. Install the reverse idler shaft bolt. You may have to line up the threaded hole in the shaft with the hole in the case with a punch or screwdriver.



*This bolt is tapered on the end. Don't confuse it with a case bolt.*

22. Install the transaxle case bolts and tighten them.



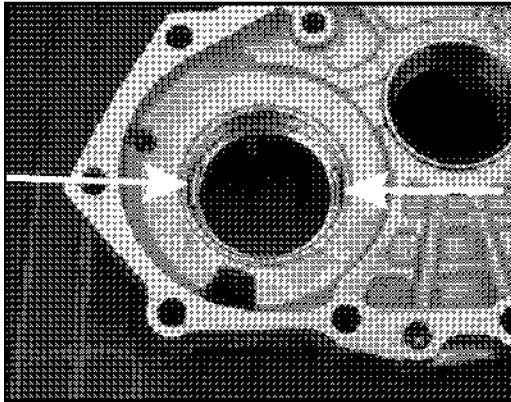
*On training center transaxles, tighten the bolts to about half specified torque to reduce wear and tear.*

23. Install the center differential.

## Transaxle Case Adapter Solder Crush Test



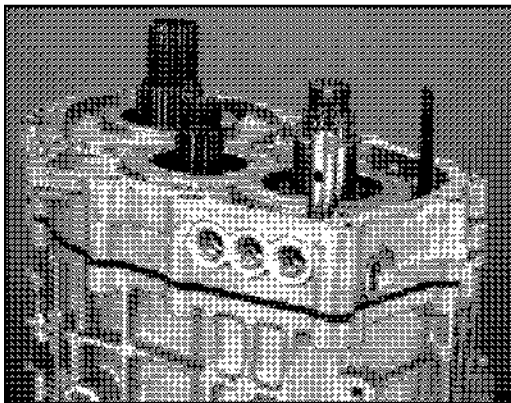
*In steps 24-31, you will use the solder crush test to select a spacer that gives the correct pre-load for the center differential.*



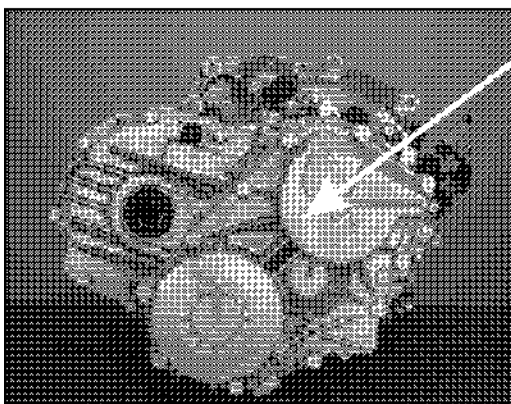
24. Remove the bearing race and spacer for the center differential from the transaxle case adapter.

25. Cut two pieces of solder measuring about 3/4 inch (20mm) in length and about 1/8 inch (3mm) in diameter. Lay them in the bearing recess in the transaxle case adapter as shown in the photo.

26. Install the center differential bearing race in the recess over the solder. Do not use the spacer.



27. Fit the transaxle case adapter over the shafts and onto the transaxle case.



28. Install the rear cover and bolts, and torque them to 39 Nm (29 ft.lbs.). Proper torque is important to get an accurate amount of solder crush.

29. Remove the rear cover bolts, rear cover and transaxle case adapter.

30. Remove the bearing race, then remove the two pieces of solder from the bearing recess.

31. Measure the thickness of both pieces with a micrometer or dial caliper.



Pre-load Calculation

1. Thickness of first piece: \_\_\_\_\_ mm

PLUS (+)

2. Thickness of second piece: \_\_\_\_\_ mm

EQUALS (=)

3. Total thicknesses: \_\_\_\_\_ mm

Divide ( $\div$ ) by 2

4. Average thickness: \_\_\_\_\_ mm

PLUS (+)

5. Specified pre-load: \_\_\_\_\_ mm

EQUALS (=)

Calculated spacer thickness: \_\_\_\_\_ mm



*If this were a customer's transaxle, you would also check end-play of the input shaft and pre-load of the intermediate shaft at the same time by laying solder in the other bearing recesses in the case. This is not necessary in the Training Center.*

32. Install a spacer of the thickness calculated above.

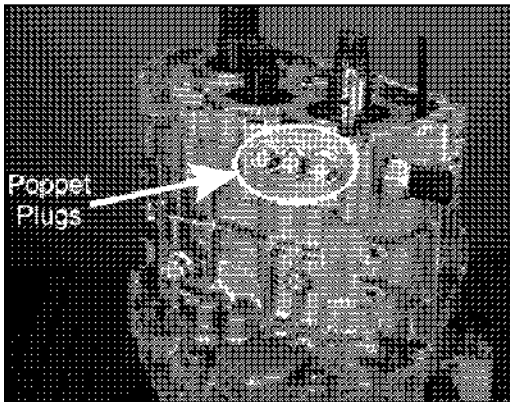


See the Service Manual for a list of available spacers. On training center transaxles, reuse the original spacer removed during disassembly.

33. Install the spacer in the transaxle case, then install the bearing race.

34. Install the transfer case adapter assembly.

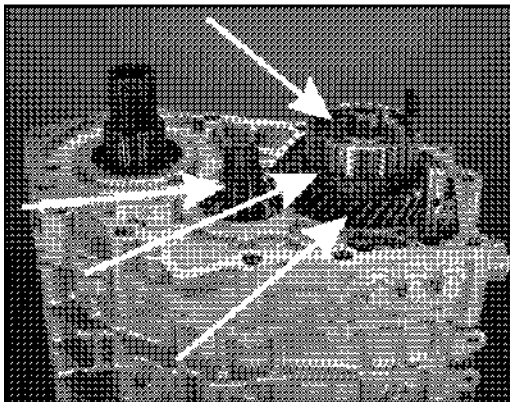
35. Install all three poppet plugs, springs and balls. These components are completely interchangeable.



36. Install the restrict ball assembly with the original gasket.

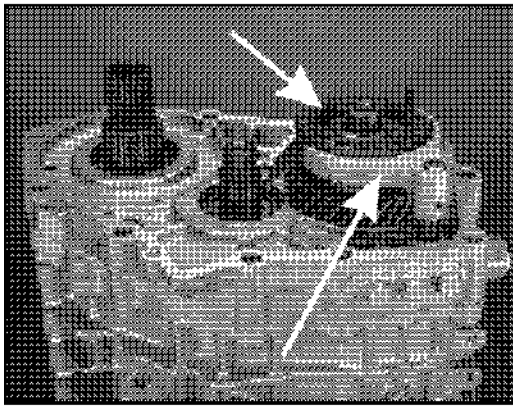
37. Install the backup light switch with the original gasket.

38. Check the clearance between the 5<sup>th</sup> speed gear and its synchro ring with a feeler gauge. If the clearance is less than 0.5mm (0.020 inch), replace the ring and/or the gear.

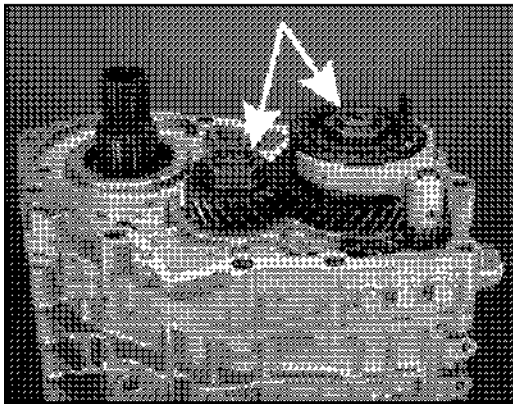


39. Install the needle bearing halves, then slide the 5<sup>th</sup> speed gear on the input shaft.

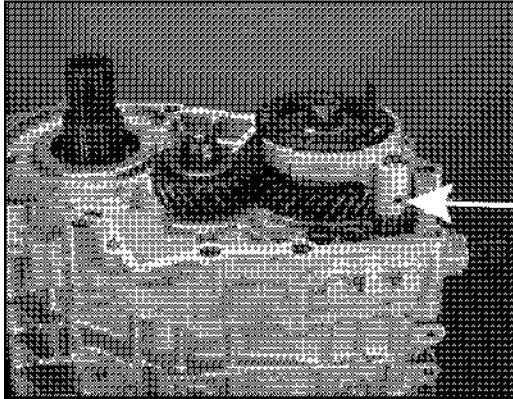
40. Slide the synchronizer ring and synchronizer hub on the input shaft.



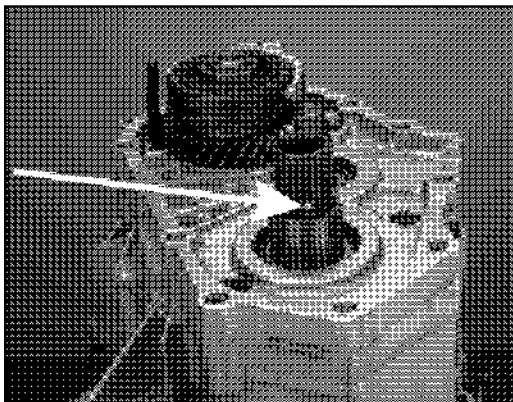
41. Install 5<sup>th</sup> gear on the intermediate shaft with special tool MD998323-01.
42. Slide the 5<sup>th</sup> gear synchronizer sleeve and shift fork on the input shaft.



43. Install the locknuts on the input shaft and intermediate shaft. If necessary, you can lock up the shafts using the same technique you used to loosen the locknut during disassembly.



44. Drive a spring pin in to secure the 5<sup>th</sup>/R shift fork to the shift rail.

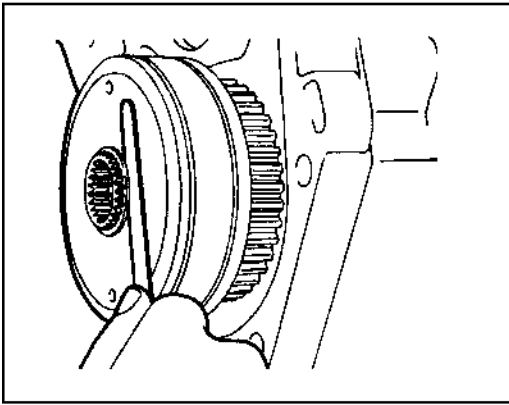


45. Push the center shaft in from the clutch housing, then insert the steel ball in the splined shaft. The steel ball acts as a detent to hold the shaft in place once the VCU is installed.

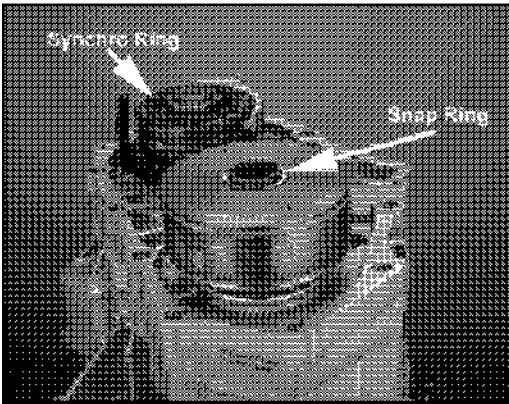


*The center shaft can fall out and cause injury to you or damage to the shaft if the VCU is not installed.*

46. Check again that the steel ball is in place, then install the VCU. You may have to tap it in place with a rubber or plastic mallet.

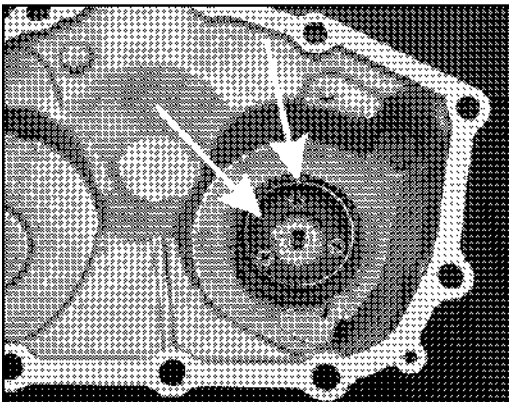


47. You can check the required thickness of the VCU snap ring with a feeler gauge as shown in the illustration. Choose a snap ring that allows the end play specified in the Service Manual.



48. Install the snap ring to secure the VCU.

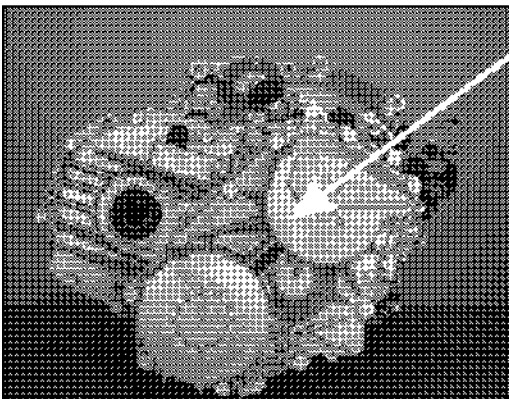
49. Install the reverse synchronizer ring on the 5<sup>th</sup>/R synchro.



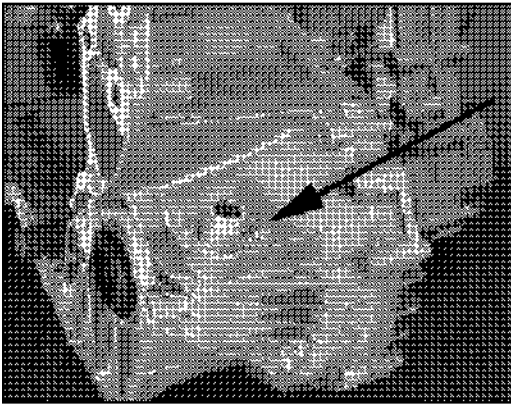
50. Make sure the wave washer is installed over the reverse brake cone in the rear cover. Hold it in place with a small amount of Vaseline or light grease if necessary.



*On some models, these may be two small tabs on the wave washer, these go towards the rear cover, and prevent the wave washer from spinning.*



51. Install the rear cover, and tighten the bolts.



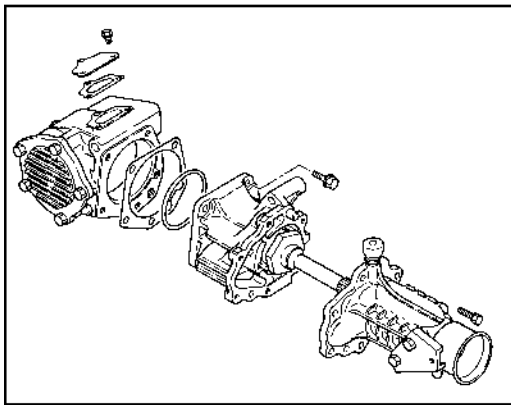
52. Install the speedometer gear. Secure it with the retaining bolt.



**PERFORMANCE CHECK**

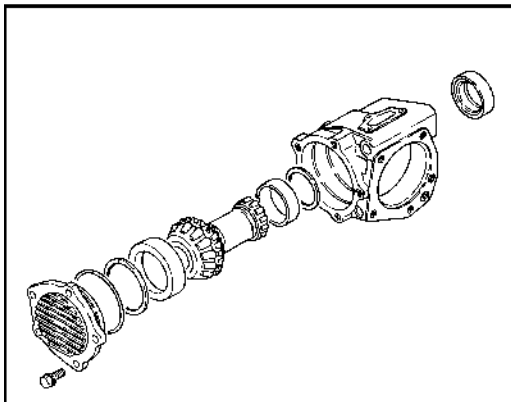
Before proceeding have the instructor check your work.

**INSTRUCTOR SIGNOFF:** \_\_\_\_\_



### AWD TRANSFER CASE DISASSEMBLY

1. Remove the bolts securing the extension housing. Use a heavy dead-blow mallet if necessary to separate the two.
2. Remove the bolts securing the transfer case adapter to the transfer case. Use a heavy dead-blow mallet if necessary to separate the two.
3. Note the metal spacer between them. The thickness of this spacer determines the mesh between the drive and driven bevel gears, and affects the gear contact pattern.



### TRANSFER CASE DISASSEMBLY

1. Remove the access cover and gasket.
2. Remove the transfer case cover. Use a soft-face mallet to evenly drive the cover off the housing.
3. Leave the O-ring in place on the cover.
4. Remove the bearing outer race and large diameter spacer from the cover.

**Note** *The thickness of this large diameter spacer, and the small diameter spacer to be removed in Step 7, determine bearing pre-load and drive-to-driven gear tooth contact.*

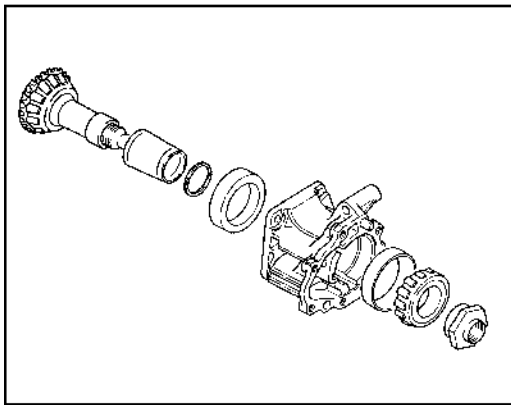
5. Record the thickness of the large diameter spacer:

**Large spacer thickness:** \_\_\_\_\_

6. Remove the drive bevel gear assembly.
7. Remove the bearing race and small diameter spacer from the transfer case.

8. Record the thickness of the small diameter spacer:

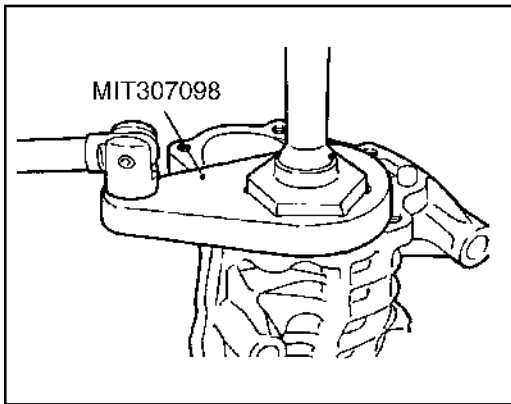
**Small spacer thickness:** \_\_\_\_\_



### TRANSFER CASE ADAPTER DISASSEMBLY (OPTIONAL)

The following procedure is performed at the discretion of the Training Center Instructor. Check with the instructor before proceeding.

1. Hold the splined driven bevel gear shaft in a vise with soft jaws.
2. Unstake the large locknut, then remove the locknut with special tool MIT307098.
3. Press the driven bevel gear assembly from the case.
4. Retrieve the spacer.
5. Record the thickness of the spacer:



**Spacer thickness:** \_\_\_\_\_

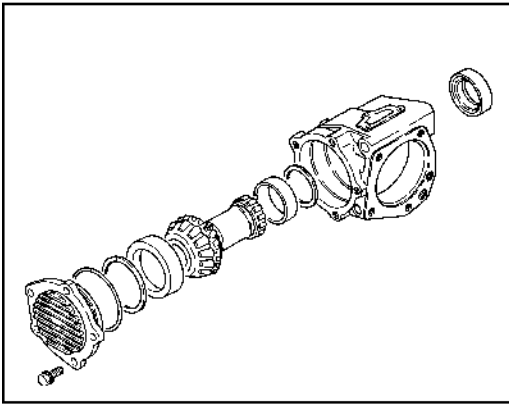


### PERFORMANCE CHECK

Have the instructor check your work.


**INSTRUCTOR SIGNOFF:** \_\_\_\_\_

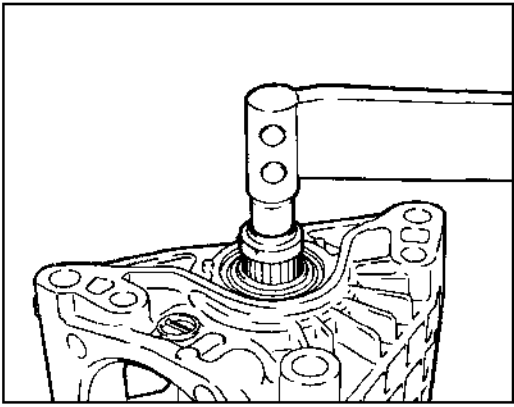




### TRANSFER CASE ASSEMBLY

1. Install the small diameter spacer and bearing race in the transfer case.
2. Install the drive bevel gear assembly.
3. Install the large diameter spacer and bearing race in the transfer case cover.
4. Tighten the 5 cover bolts to 35-42 Nm (26-30 ft.lbs.).

 *Proper torque is necessary to accurately measure bearing pre-load.*

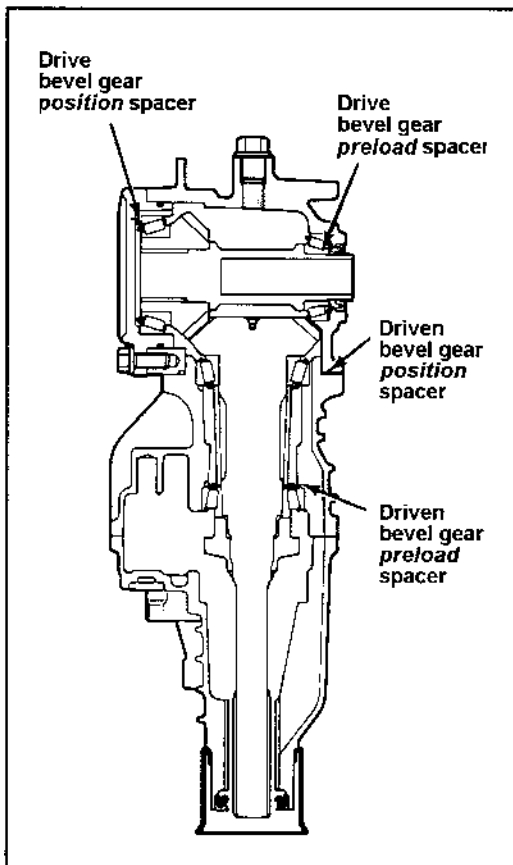


### DRIVE BEVEL GEAR BEARING PRE-LOAD ADJUSTMENT

1. Attach special tool MD990988-A to a torque wrench and insert the tool into the splined end of the drive bevel gear shaft.
2. Turn the drive bevel gear shaft with the torque wrench and record the torque necessary to turn it.

**Torque measured:** \_\_\_\_\_

**Specified Torque: 1.7-2.5 Nm (15-22 in.-lb.)**



3. If the torque require to turn the shaft is 1.7-2.5 Nm (15-22 in. lbs.) then bearing pre-load is correct, and you can proceed to "Driven Bevel Gear Pre-load Adjustment" below.
4. If the turning torque is not within specifications, both the large and small diameter spacers must be changed.

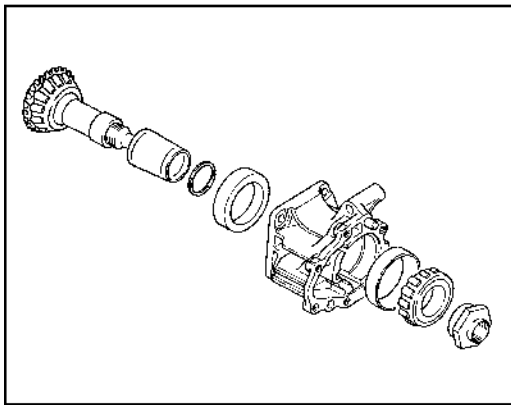
**Note** *The thickness of these spacers should be nearly the same. When adjusting pre-load, change both spacers to keep them approximately equal thickness.*

5. If turning torque is too high, reduce the thickness of both spacers by equal amounts. If turning torque is too light, increase the thickness of both spacers by equal amounts.
6. Disassemble the Transfer Case, insert the new spacers, then reassemble the case and measure turning torque again. Repeat as often as necessary to get the turning torque and, therefore the pre-load, within specifications.

7. Record your final choice of spacers:

**Large diameter spacer thickness:** \_\_\_\_\_

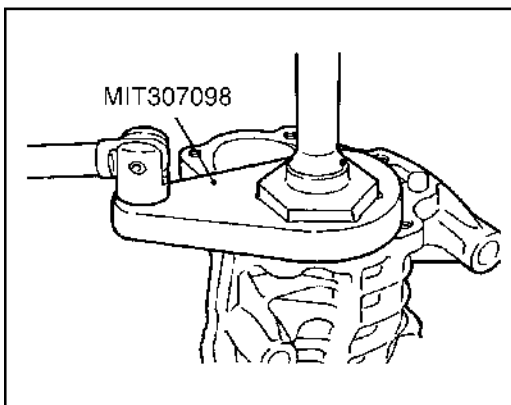
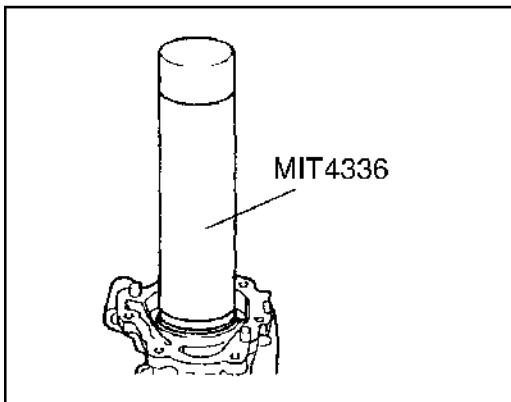
**Small diameter spacer thickness:** \_\_\_\_\_



### TRANSFER CASE ADAPTER ASSEMBLY (OPTIONAL)

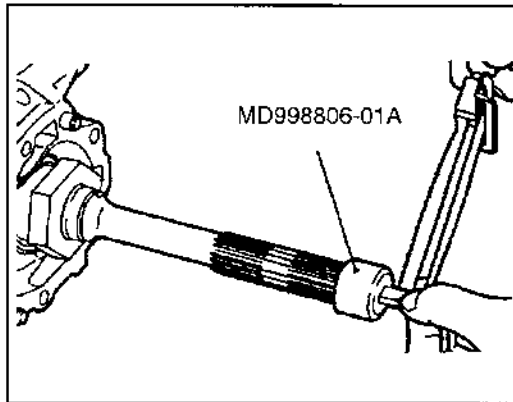
The following procedure is performed only if the instructor required disassembly.

1. Make sure the collar and small spacer are assembled on the driven bevel gear assembly.
  2. Insert the driven bevel gear assembly into the case.
  3. Install the bearing using the special tool shown (MIT4336).
  4. Hold the transfer case adapter in a vise with soft jaws.
  5. Install the large locknut, using the special tool shown (MIT307098).
- Note** Don't torque the locknut or stake it on Training Center transfer cases.
6. Check Driven Bevel Gear Bearing Pre-load Adjustment as described next.



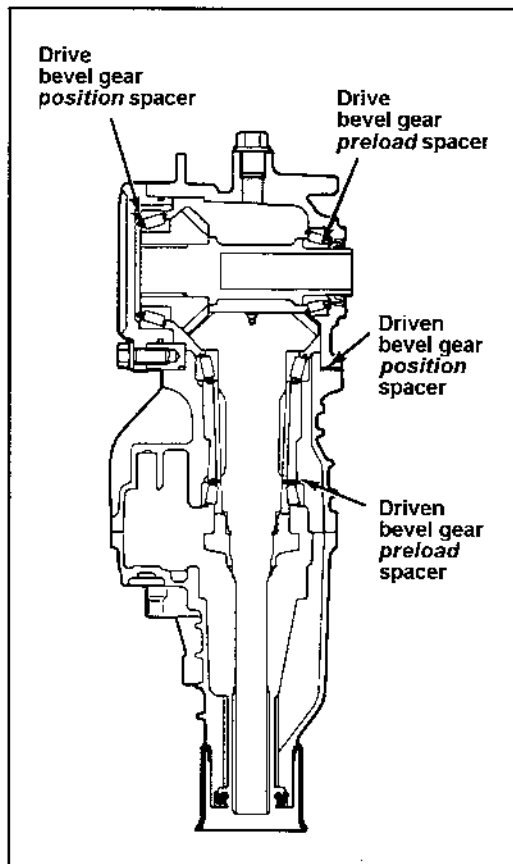
## DRIVEN BEVEL GEAR BEARING PRE-LOAD ADJUSTMENT

1. Attach special tool MD998806-01-A to a torque wrench and connect the tool to the splined end of the driven bevel gear shaft.
2. Turn the driven bevel gear shaft with the torque wrench and record the torque necessary to turn it.



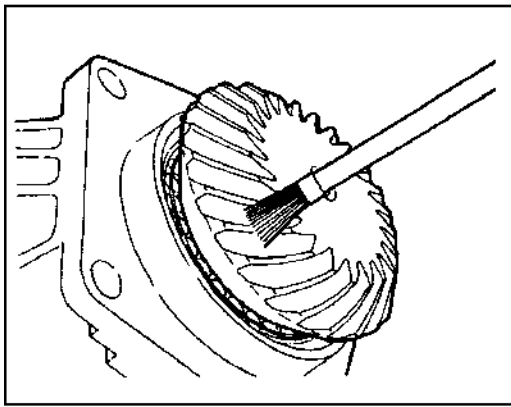
**Torque measured:** \_\_\_\_\_

3. If the torque require to turn the shaft is 1.0-1.7 Nm (9-15 in. lbs.) then bearing pre-load is correct, and you can proceed to "Gear Contact Pattern" below.
4. If the turning torque is not within specifications, the existing spacer between the gear assembly and the collar must be replaced. If turning torque is too high, increase the thickness of this spacer. If turning torque is too light, decrease the thickness of the spacer.
5. Disassemble the Transfer Case, insert the new spacer, then reassemble the case and measure turning torque again. Repeat as often as necessary to get the turning torque and, therefore the pre-load, within specifications.



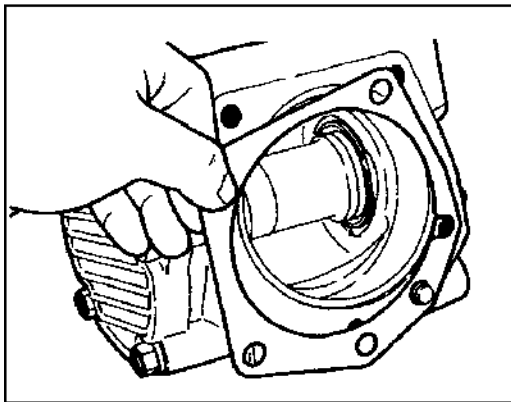
6. Record your final choice of spacer:

**Spacer thickness:** \_\_\_\_\_



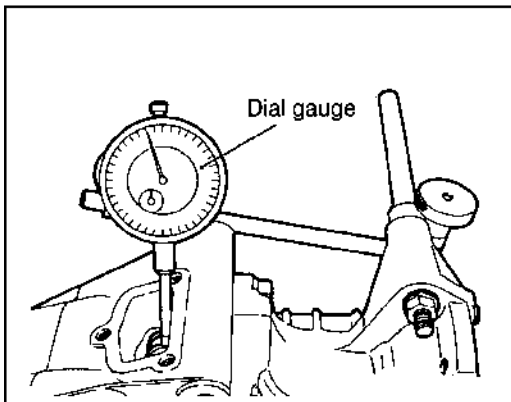
## GEAR CONTACT PATTERN

1. With the transfer case disassembled, apply prussian blue (or equivalent) to all tooth surfaces on the driven bevel gear.



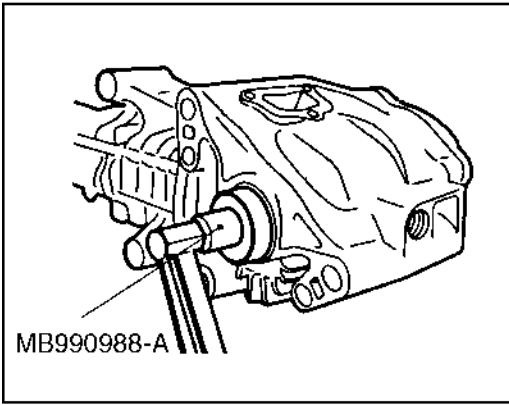
2. Assemble the Transfer Case Adapter to the Transfer Case using the existing metal spacer between them.

3. Tighten the 5 cover bolts to 35-42 Nm (26-30 ft.lbs.).



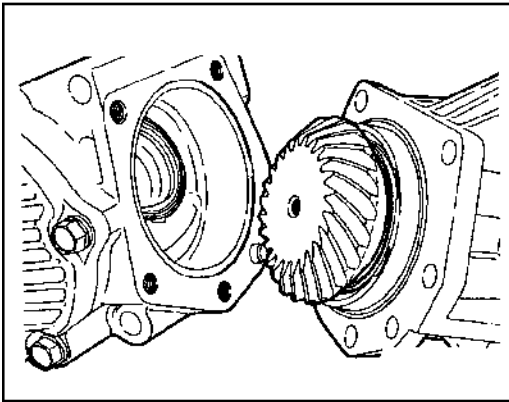
4. Setup a dial indicator through the access cover to bear on a tooth of the drive bevel gear. Rotate the driven gear shaft slightly (no more than 1/8 turn to avoid blurring the contact pattern), and verify that backlash between the gears is within 0.080-13mm (0.003-0.005 in.).

**Note** The contact pattern will not be a reliable indicator if backlash is excessive.



5. If backlash is within specifications, rotate the drive bevel gear shaft one turn in each direction to transfer the gear contact pattern from the driven bevel gear to the drive bevel gear.

**Note** Don't rotate the shaft more than one turn or the contact pattern will blur and be difficult or impossible to read.



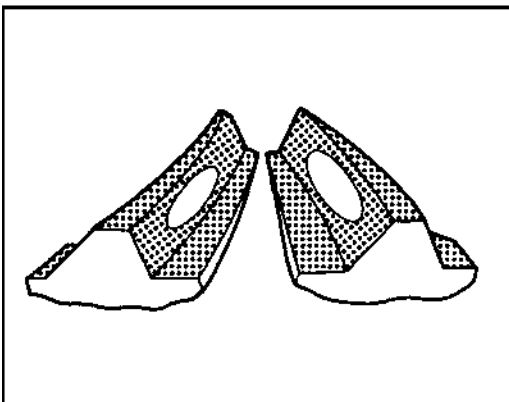
6. Disassemble the Transfer Case Adapter and the Transfer Case and compare the gear contact pattern with the illustrations.



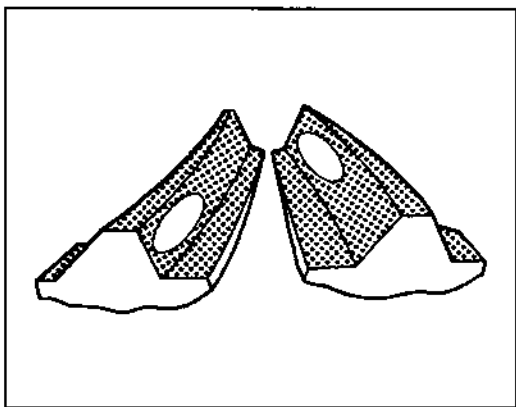
**PERFORMANCE CHECK**

Discuss your interpretation of the gear contact pattern with the instructor before proceeding.

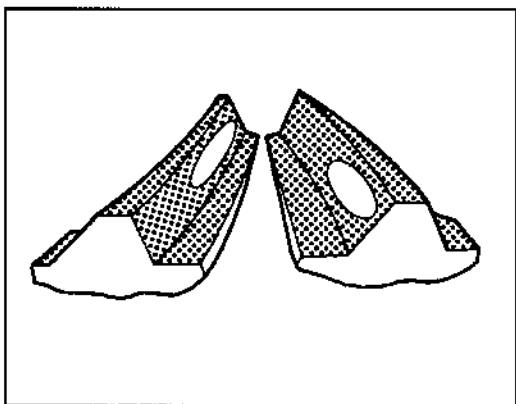
**INSTRUCTOR SIGNOFF:** \_\_\_\_\_



7. If the pattern appears normal, assemble the transfer case as described below under "Transfer Case Assembly."



8. If the pattern indicates that the driven bevel gear is too high, disassemble the Transfer Case Adapter and the Transfer Case, and replace the metal spacer with one that is thicker.



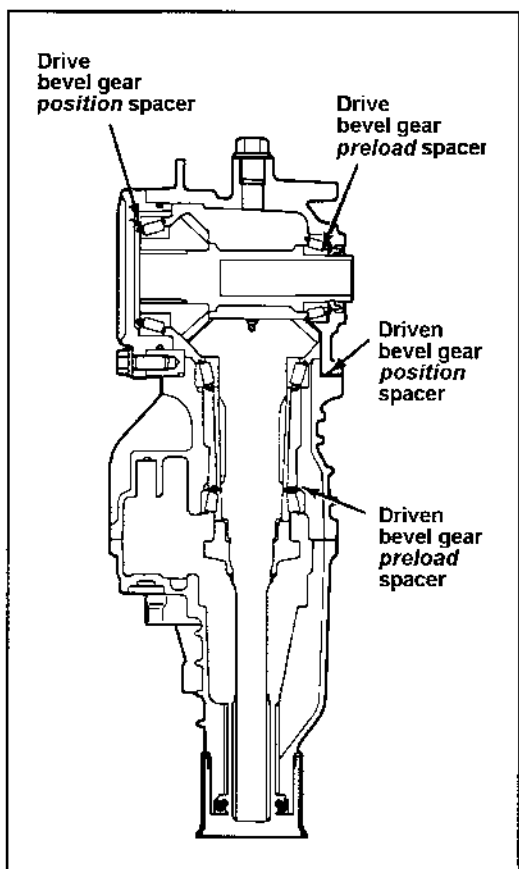
9. If the pattern indicates that the driven bevel gear is too low, disassemble the Transfer Case Adapter and the Transfer Case, and replace the metal spacer with one that is thicker.

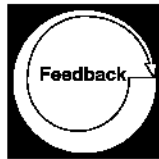
10. Clean off the gears, and recheck the gear tooth contact pattern as many times as necessary to get gear contact correct.

11. When gear contact is correct, clean off the gears and assemble the transfer case as described below under "Transfer Case Assembly."

### TRANSFER CASE ASSEMBLY

1. Assemble the Transfer Case Adapter to the Transfer Case using the correct metal spacer and O-ring between them.
2. Tighten the 5 cover bolts to 35-42 Nm (26-30 ft.lbs.).
3. Install the access cover and gasket.
4. Bolt the extension housing to the transfer case. Tighten the bolts to 15-22 Nm (11-15 ft.lbs.).





### PERFORMANCE OBJECTIVE SIGN-OFF

Have the instructor check your work.

**Instructor's  
Initials**

**Objective**

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- |       |  |
|-------|--|
| _____ | 1. Overhaul a W5M31/33 transaxle.                                      |
| _____ | 2. Use solder crush techniques to setup bearing pre-load and end-play. |
| _____ | 3. Disassemble and assemble an AWD transfer case.                      |
| _____ | 4. Check and adjust bearing pre-load in the AWD transfer case.         |
| _____ | 5. Check and adjust gear tooth contact in the AWD transfer case.       |





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